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MODEL GAK25H SERVICE MANUAL



Lowrey
organs

CITATION THEATRE CONSOLE

SERVICE INFORMATION

Specifications	2
Circuit Description	4
Circuit Description/Adjustments	9
Troubleshooting Guide	10
Block Diagram	16

SCHEMATICS

Drawing No.1	Tone Generators, Repeat & Diode Keying	17
Drawing No.2	U.M. Diode Keying Groups, 2-2/3' Audio Keyswitching & Tabswitching	18
Drawing No.3	Bass Pedals	19
Drawing No.4	U.M. 16' Solo, L.M. Keyswitching & Tabswitching	20
Drawing No.5	Flute & Reed/String Filters, Doublers & Percussion	21
Drawing No.6	Stereo Switching, Reverb & Multi-Channel Chorus	22
Drawing No.7	Amplifiers, Speaker Tabswitching	23
Drawing No.8	Power Supply	24
Drawing No.9	A.O.C.	25
Drawing No.10	Golden Harp	26
Drawing No.11	Brass Symphonizer, Tremolo & Wow Wow	27

CHARTS & DIAGRAMS

Upper Manual Diode Keying Board	28
A.O.C., Coupler & Sustain Control Board, Golden Harp Board & Chimes Board	29
Brass & Wow Wow Keying Board	30
A.O.C. Keying Chart	31
Transistor Basing Diagrams	32
Transistor Location Chart	33

PHOTOGRAPHS

Tone Generator Board	34
Tone Generator Output Board	35
Vibrato Board, Percussion Board	36
Flute Quality Control Board	37
Reed/Diapason Quality Control Board	38
Bass Pedal Board	39
Bass Pedal Voicing Board	40
Reverb Board	41
Repeat Chassis	42
Golden Harp Board	43
Multi-Channel Chorus Board	44
Golden Harp/Glide/Expression Pedal Assembly	45
Brass Keying Board	46
Brass Voicing Board	47
Wow Wow Board	48
Main/Leslie Amplifier Board	49
Amplifier/Power Supply Chassis (Top View)	50
Amplifier/Power Supply Chassis (Bottom View)	51

PLAY-ALONG (K Section)

SERVICE INFORMATION

Circuit Description	52
General Troubleshooting Guide	55

SCHEMATICS

Drawing No.K1	Automatic Rhythm Clock	56
Drawing No.K2	Matrix	57
Drawing No.K3	Reverberating Rhythm Switching & Control Circuits	58
Drawing No.K4	Automatic Rhythm Selector Switches	59
Drawing No.K5	Instrumentation	60
Drawing No.K6	Cassette	61

CHARTS & DIAGRAMS

Clock Waveforms	62
Rhythm Patterns	63
K Transistor Location Chart	65

PHOTOGRAPHS

Reverberating Rhythm Board	66
Clock & Matrix Board	67
Instrumentation Board	68

PARTS

Parts Information	69
Parts List	70

SPECIFICATIONS



THE LOWREY CITATION THEATRE CONSOLE (Model GAK-25H)... Beauty in styling and excellence in performance with Lowrey's all-new Brass Symphonizer!

For those who want the very best, Lowrey has designed the ultimate in beauty and sound. A console-sized theatre organ that's as beautiful to play and listen to as it is to see. Built-in to the luxurious cabinet are such fine Lowrey features as the new Brass Symphonizer - an electronic marvel that lets you introduce a complete brass section with the mere push of a button; the famous Stereo Cassette Recorder; Automatic and Reverberating Rhythm; exclusive AOC (Automatic Organ Computer); Glide and Golden Harp plus innumerable other Lowrey features, all of which add up to top performance.

A completely solid-state stereo theatre console organ with two 61-note keyboards and a 25-note pedal-board. Two high fidelity amplifiers, in harmony with four speakers: two heavy-duty 12" wide-range, one 6"x9" high-range (Main) and one 10" high-range (Leslie). A stereo headphone jack for playing in privacy. An auxiliary input jack for special hook-ups. Built-in controls for external tone cabinets. Dimensions: 44-1/8" high x 53-1/8" wide x 29-1/2" deep. Available in Walnut.

UPPER KEYBOARD

VOICES

Trombone 16'
Clarinet 16'
Trumpet 8'
Oboe 8'
Kinura 8'
Cello 16'
Violin 8'
Tibia 16'
Tibia 8'
Tibia 4'
Tibia 2-2/3'
Tibia 2'

CONTROL TABS

Reed String... Full
Tibia 4'... Full
Tibia 2-2/3'... Full
Tibia 2'... Full

COUPLER

Reed String 4'

LOWER KEYBOARD

VOICES

Tibia 8'
Diapason 8'
Violin 8'
Cornet 8'
French Horn 8'
English Horn 8'

CONTROL TABS

Accompaniment 8'... Med
Accompaniment 8'... Full

PEDALS

VOICES
Flute 8'
Tuba 8'
Bass Guitar 8'
Diapason 8'
Diaphone 16'
Bourdon 16'

CONTROL TABS

Pedal... Soft
Pedal... Medium
Pedal... Full

Pedal... Loud

Pedal Sustain (Flute/Bourdon)

COUPLERS

Lower to Lower 4'
Solo to Accompaniment

SPECIFICATIONS

GENERAL CONTROLS & CONTROL TABS

Brilliance... Full
Lights... Off
Lights... Soft
Lights... Full
Expression Pedal
On/Off Switch with Pilot Light

SPECIAL FEATURES

VIBRATO

Vibrato... Off/On
Vibrato... Light/Heavy
Vibrato... Slow/Fast

SUSTAIN

Sustain... Medium
Sustain... Long

REVERB

Reverb Control
Reverb Selector... Leslie/Main / Leslie and Main

CHIMES

Chimes... Off/On

WOW WOW *

Wow Wow... Mute
Wow Wow... Full
Wow Wow... Low/High
Wow Wow Attack Control
Wow Wow Decay Control

GLIDE

Glide... Normal/Vibrato Cancel
Glide Control on Expression Pedal

AOC - AUTOMATIC ORGAN COMPUTER

LESLIE SPEAKER

Leslie Tremolo... Off/On
Reed/String/Diapason... Main/Leslie
Tibia... Main/Leslie
Add Main to Leslie... Full
Leslie... Internal/External

MULTI-CHANNEL CHORUS

Multi-Channel Chorus... Off/On

PERCUSSION

Percussion... Off/On
Percussion... Short/Long
Percussion... Tibia/Reed String
Repeat... Off/On
Repeat Speed Control
Marimba Repeat... Off/On
Manual Attack... Normal/Slow

GOLDEN HARP

Golden Harp Control on Expression Pedal
Golden Harp Speed Control... Slow/Fast

THE BRASS SYMPHONIZER

VOICES
Flugel Horn
Cornet
Krumet Horn
Post Horn

CONTROLS

Cancel-Upper Manual
Cancel-Preset
Symphonizer Tremolo Speed Control
Symphonizer Tremolo Depth Control
Symphonizer Volume Control

AUTOMATIC RHYTHM

AUTOMATIC RHYTHM Patterns

LATIN AMERICAN	TRADITIONAL	AMERICAN
Bosa Nova	March Polka	Go-Go
Samba	Waltz	Dixie
Rhumba		Shuffle
Cha-Cha		Swing I
Mambo		Swing II
		Swing Waltz

REVERBERATING RHYTHM

Bass Drum
Snare-One Shot
Snare-Roll
Brush
Cymbal
Tom-Tom
Bongo
Blocks
Clave
Castanets

RHYTHM CONTROLS

Rhythm Volume
Rhythm Balance
Rhythm Tempo & Metronome Switch
Start Switch
Downbeat Indicator Light
Reverberating Rhythm On/Off Switch
Brush Accent

PLAY-ALONG STEREO CASSETTE RECORDER

Stop
Record
Rewind
Fast Forward
Play-Record
Pitch Control
Cassette Volume Control
Playback Balance
Microphone Input Jack

CIRCUIT DESCRIPTION

VIBRATO

(Refer to Drawing No.1)

Q1 VIBRATO OSCILLATOR

Develops a continual low-frequency, high-impedance sine wave of sufficient amplitude to drive the Vibrato Emitter Follower Q2.

Q2 VIBRATO EMITTER FOLLOWER

Converts the high impedance sine wave from the Vibrato Oscillator Q1 to a low-impedance alternating current. This alternating current alternately shifts the frequency of the twelve Master Oscillators Q3.

TONE GENERATORS

(Refer to Drawing No.1)

Q3 MASTER OSCILLATOR

Develops a continual audio frequency signal, the output of which is connected to the Buffer Q4 and the 1st Divider. Twelve such Master Oscillators are used to determine proper musical pitch for the entire organ.

Q4 BUFFER

The Buffer acts as an isolation stage between the Master Oscillator Q3 and the diode keying and keyswitches.* This prevents any change in Master Oscillator frequency due to change in circuit load and provides proper drive signal for first Divider.

Q5 WAVE SHAPER

The Wave Shaper prevents D.C. keying and audio keying from effecting the first divider output, insuring proper second divider drive signal.

1ST DIVIDER

Produces a continual audio frequency signal of exactly half the frequency of the Master Oscillator Q3. The output of the 1st Divider is connected to the Brass Symphonizer, diode keying and keyswitches.* The 1st Divider output signal is also used to drive the 2nd Divider.

2ND DIVIDER

Produces a continual audio frequency signal of exactly half the frequency of the 1st Divider. The output of the 2nd Divider is connected to the diode keying and keyswitches.* The 2nd Divider output signal is used also to drive the 3rd Divider. On tone generators D# and E only, the output of the 2nd Divider is used for the Rhythm. (See Rhythm section.)

3RD DIVIDER

Produces a continual audio frequency signal of exactly half the frequency of the 2nd Divider. The output of the 3rd Divider is connected to the diode keying, bass keying and keyswitches.* The 3rd Divider output signal is also used to drive the 4th Divider.

4TH DIVIDER

Produces a continual audio frequency signal of exactly half the frequency of the 3rd Divider. The output of the 4th Divider is connected to the diode keying, bass keying and keyswitches.*

5TH DIVIDER

Produces a continual audio frequency signal of exactly half the frequency of the 4th Divider. The output of the 5th Divider is connected to the Upper Manual Solo Keyswitches and Lower Manual Audio Keyswitches.*

* Tone generator outputs are mixed for proper waveshaping in Non-Sustain Networks prior to being connected to the Upper/Lower Manual Audio Keyswitches.

REPEAT

(Refer to Drawing No.1)

Q13, Q14 REPEAT MULTIVIBRATOR

When the Repeat tabswitch is on, this circuit alternately produces negative pulses at the collector of each transistor. The alternate negative pulses from the Repeat Multivibrator are applied to the Pulse Shapers (Q15 and Q16).

Q15, Q16 PULSE SHAPER NO.1 and 2

Negative pulses from the Repeat Multivibrator (Q13, Q14) causes the Pulse Shapers to alternately produce positive voltage pulses. The positive voltage pulses are directly connected to the Pulse Drivers Nos. 1 and 2 (Q17 and Q18).

Q17, Q18 PULSE DRIVER NO.1 and 2

Q19, Q20 PULSE KEYER NO.1 and 2

These circuits function together to produce alternate positive keying pulses. The keying voltage pulses are applied to the Upper Manual D.C. keyswitches, coupler and A.O.C. Intelligence on busses via the A.O.C., Attack and Coupler (Solo to Accomp.) tabswitches.

UPPER/LOWER MANUAL

(Refer to Drawing Nos. 2 & 4)

Q21, Q22 UPPER MANUAL 8' COLLECTOR PREAMP & EMITTER FOLLOWER

Audio signals from the 2', 4' & 8' Upper Manual diode keying groups are combined and amplified. The output of these preamps is connected to the Trombone, Trumpet, Oboe, Kinura, Cello and Violin tabswitches.

Q23 UPPER MANUAL 16' COLLECTOR PREAMP

Audio signals from the Upper Manual 16' diode keying groups are combined and amplified. The output of the preamp is connected to the Trombone, Clarinet and Cello tabswitches.

Q34 LOWER MANUAL 8' REED/STRING COLLECTOR PREAMP

Audio signals from the Lower Manual 8' Audio Keyswitch groups are combined and amplified at this preamp. The output of the preamp is connected to the Violin, Cornet, French Horn and English Horn tabswitches.

Q114 UPPER MANUAL 16' SOLO DIVIDER PREAMP & 16' SOLO DIVIDER NETWORK

An audio signal from any one of the first twelve Upper Manual Solo Keyswitches is amplified by the Upper Manual 16' Solo Divider Preamp (Q114) to provide sufficient drive signal for the Upper Manual 16' Solo Divider which produces an audio frequency signal of exactly half the amplified input frequency. The input frequency is selected by the series opening keyswitches located on the first twelve Upper Manual keys. The output of the Upper Manual Solo Divider Network is connected to the Upper Manual 16' Flute Tabswitch.

CIRCUIT DESCRIPTION

FLUTE FILTERS AND PREAMPS

(Refer to Drawing No.5)

- Q35 150 CYCLE FILTER
- Q36 212 CYCLE FILTER
- Q37 300 CYCLE FILTER
- Q38 425 CYCLE FILTER
- Q39 600 CYCLE FILTER
- Q40 850 CYCLE FILTER
- Q41 1200 CYCLE FILTER
- Q42 1700 CYCLE FILTER

Most audio signals from the Upper and Lower Manual Flute tabswitches are filtered by these filters to produce the various Flute voices. The combined output of the 150 through 1700 cycle Flute Filters is connected to the Percussion tabswitches where — depending upon the tab setting — the Flute signal connects to the Flute Preamp Q50 or Percussion circuits Q52-Q54.

Q43 DOUBLER AMP

Audio signals from the 2400 and 3400 cycle Flute Doubler are combined at and amplified by this amp. The output is connected to the output of the Flute Filters.

REED/DIAPASON FILTER

(Refer to Drawing No.5)

- Q44 425 CYCLE FILTER
- Q45 600 CYCLE FILTER
- Q46 850 CYCLE FILTER
- Q47 1200 CYCLE FILTER
- Q48 1700 CYCLE FILTER

Audio signals from the Upper Manual Reed/Diapason tabswitches and Lower Manual Reed/Diapason tabswitches are filtered to produce the various Reed/Diapason voices. The combined output from the 425 through 1700 cycle Reed/Diapason Filters is connected to the Reed/String Preamp Q51.

Q49 STRING PREAMP

Audio signals from the Upper Manual Cello and Violin tabswitches, and also from the Kinura tabswitch, are connected to and amplified by this preamp. The output is connected to the Reed/String Preamp Q51.

Q50 FLUTE PREAMP

Audio signals from the 150 through 1700 cycle Flute Filters and Doubler Amp Q43 are connected to and amplified by this preamp. The output of Flute Preamp Q50 is connected to the Multi-Channel Chorus tabswitch.

Q51 REED/STRING PREAMP

Audio signals from the 150 through 1700 cycle Reed/Diapason Filters and String Preamp Q49 are connected to and amplified by this preamp. The output is connected to the Multi-Channel Chorus tabswitch.

PERCUSSION

(Refer to Drawing No. 5)

Q52 BASS BYPASS

Low frequency audio signal from the Flute or Reed/Diapason Filters is amplified by this preamp whenever one of the Upper Manual Keys or Lower Manual Coupler Keys is depressed. Output from the Bass Bypass is connected to the Flute or Reed/String Preamp Q50 & Q51 via the Percussion tabswitch.

Q53 PERCUSSION MODULATOR

Audio signal from the Flute or Reed/Diapason Filters is amplified momentarily by the Modulator whenever one of the Upper Manual Keys or Lower Manual Coupler Keys is depressed. Output from the Percussion Modulator is connected to the Percussion Preamp Q54.

Q54 PERCUSSION PREAMP

Amplifies the audio signal from the Percussion Modulator Q53. The output of this preamp is connected either to the Flute or Reed/String Preamp Q50 & Q51 via the Percussion tabswitch.

Q55 & Q56 PULSE DETECTORS

Depressing any of the Upper Manual Keys or Lower Manual Coupler Keys produces positive voltage pulses across the 10 ohm repeat B+ supply resistor. These pulses are connected to the Pulse Detectors which then amplify the pulses and couple them to the Percussion Multivibrator Q57-Q58.

Q57 & Q58 PERCUSSION MULTIVIBRATOR

This circuit functions as either a one-shot or combination one-shot and free-running multivibrator depending upon the setting of the Percussion Repeat Switch. When Repeat is in the "off" position, only a single positive voltage output pulse may be produced at the collector of Q58. When Repeat is in the "on" position, the multivibrator free runs at the speed set by the Repeat Speed Control VR5. Depressing any of the Upper Manual keys or Lower Manual Coupler keys "restarts" the multivibrator from the moment the key is pressed. As the multivibrator free runs, it produces a series of positive voltage output pulses at the collector of Q58.

Q59 DRIVER

The Driver momentarily conducts when triggered by the Percussion Multivibrator, thus controlling the momentary gain of the Percussion Modulator Q53. The Modulator is turned on the same moment that the Driver is turned on. The linear decay of the Modulator is determined by the adjustment of the Driver circuit, which is controlled by the Percussion Adjustment VR6.

BASS PEDALS

(Refer to Drawing No.3)

Q24-Q25 PEDAL CANCEL TRIGGER

Depressing any Bass Pedal Switch creates a pulse which causes this circuit to produce a bigger pulse thus triggering (turns on momentarily) the Pedal Cancel Transistor Q26.

CIRCUIT DESCRIPTION

Q26 PEDAL CANCEL TRANSISTOR

This transistor momentarily conducts when there is a pulse from the Pedal Cancel Trigger Q24, Q25. When the Pedal Cancel Transistor conducts, any positive voltage in a pedal sustain capacitor is conducted through the pedal cancel line, and Diode D21 to -8 volts and thus neutralized. The -8 volts from the Pedal Cancel transistor is also applied as a pulse to the Guitar Bass Keyer Q27 and through D76 & D79 resetting the 8' & 16' Brass Pedal Keyers.

Q27 GUITAR BASS KEYER

The negative pulse from the Pedal Cancel Transistor Q26 triggers the Guitar Bass Keyer which then produces a strong positive pulse. This strong pulse is used to key momentarily Diodes D29-D30 which allow the output signal from the 1st Pedal Divider Q30-Q31 to pass through on to the bass pedal tabswitches.

Q28 & Q29 PEDAL KEYER & PEDAL KEYER Emitter FOLLOWER

Pressing a bass pedal switch applies a positive voltage to these two circuits. They in turn apply a strong keying voltage to the base of the Pedal Pulse Amp Q160, and through Diode D75 to D27, 28, 31 & 32 and the Rhythm. (See Play-Along section). When the Pedal Sustain or Guitar Bass tabswitch is turned on, a 15 mfd capacitor keeps Diodes D27, 28, 31 & 32 keyed for a short length of time after the pedal is released.

Q30, Q31 1ST PEDAL DIVIDER

Pressing a bass pedal, keys a Diode D22, allowing the signal from a tone generator to pass to the pedal collector line and on to the 1st Pedal Divider. The 1st Pedal Divider produces a signal of exactly half the frequency of the input signal from the tone generator. The output of the 1st Pedal Divider connects to Diodes D27, 28, 29, 30, the 2nd Pedal Divider, Q32 & Q33 and the 8' Pedal Brass Keyer Q162.

Q32, Q33 2ND PEDAL DIVIDER

The second pedal Divider produces a signal of exactly half the frequency of the input signal from the 1st Pedal Divider Q30, Q31. The output of the 2nd pedal Divider connects to Diodes D31, D32 and the 16' Brass Pedal Keyer.

Q160, Q161 PEDAL PULSE AMP, INVERTER

A positive voltage from the Pedal Keyer Emitter Follower (Q29) is applied to the base of the Pedal Pulse Amp (Q160), causing it to conduct which lowers the voltage at the base of the Inverter (Q161) causing it to conduct allowing a positive voltage to be applied to the base of the 8' & 16' Pedal Brass Keyers (Q162 & Q164).

Q162, Q164 8' & 16' PEDAL BRASS KEYERS

A positive voltage from the Inverter (Q161) biases on the 8' & 16' Pedal Brass Keyers allowing signal from the first and second pedal dividers to pass on to the 8' & 16' Pedal Brass Keyer Emitter Followers.

Q163 & Q165 PEDAL BRASS KEYER Emitter FOLLOWERS

Signal from the 8' & 16' Pedal Brass Keyers is converted to a low impedance output signal that is applied to pedal tabswitches and filters.

Q166 & Q168 150 CYCLE PEDAL FILTERS

Audio signal from the pedal tabswitches and pedal dividers is filtered to produce various pedal voices, the output of the 150 cycle Filters is then connected to the Pedal Output Preamp (Q167).

Q167 PEDAL OUTPUT PREAMP

Audio signal from the two 150 cycle Pedal Filters is connected to and amplified by the Pedal Output Preamp (Q167). The output is then connected to the Main and Leslie Mixing Preamps through the pedal volume switches.

STEREO SWITCHING

(Refer to Drawing No.6)

Q71 RHYTHM Emitter FOLLOWER

Audio signals from all the Rhythm voice circuits are combined at, and amplified by, this Preamp. The output of this preamp is connected to the Main and Leslie Mixing Preamps Q60-Q63 and to the Reverb Driver Q64.

Q60, Q61 LESLIE MIXING PREAMPS

Audio signal from the Flute and or Reed/String Preamps depending on the setting of the Flute and Reed/String Main/Leslie tabswitches, connects to these Preamps. Also, audio signal from the Rhythm, Bass Pedals and Brass Symphonizer connects to these preamps. The output from Preamp Q61 is applied to the Leslie Expression pedal photocell P5A.

Q62, Q63 MAIN MIXING PREAMPS

Audio signal from the Flute and or Reed/String Preamps, depending on the setting of the Flute and Reed/String Main/Leslie tabswitches, connects to these Preamps. Also, audio signal from the Rhythm, Bass Pedals and Brass Symphonizer connects to these preamps. The output from Preamp Q63 is applied to the Main Expression pedal photocell P5B.

REVERB

(Refer to Drawing No.6)

Q64 REVERB DRIVER

Audio signal from the Flute Preamp Q50, Reed/String/Diaphason Preamp Q51, Rhythm Emitter Follower Q71, Brass Symphonizer and Cassette output is amplified and connected to the Reverb Spring Unit where the Reverb effect is produced.

Q65 REVERB PREAMP NO.1

Reverberating audio signal from the Reverb Spring Unit is amplified for the first time. The output signal is then sent on to Reverb Preamp No.2.

Q66 REVERB PREAMP NO.2

Further amplification of the Reverb signal is accomplished, plus the Reverb signal is controlled at the output of this circuit. With the Reverb control off, all Reverb signal is grounded.

Q67 MIXER

Reverb signal from Reverb Preamp No.2 is amplified by this circuit. The output signal from the Mixer circuit is connected to the Reverb Output Emitter Follower.

CIRCUIT DESCRIPTION

Q68 REVERB OUTPUT EMITTER FOLLOWER

Reverb signal from Mixer Preamp Q67 is switched at the output of this transistor between the Main and/or Leslie Amplifiers.

MULTI-CHANNEL CHORUS

(Refer to Drawing No. 6)

Q75-Q80 MULTI-CHANNEL CHORUS OSCILLATOR

This consists of two unijunction relaxation oscillator circuits (Q76 & Q78) with driver transistors (Q77 & Q79) and a multivibrator (Q75 & Q80). The two unijunction oscillators each run at a different speed and produce negative pulses at their drivers. These pulses interrupt the normally consistent operation to the multivibrator. As a result the multivibrator produces a random output waveform. This waveform is then RC filtered and connected as a drive signal to the Main and Leslie Phaser Lamp Drivers. When the Leslie Tremolo tab-switch is on, the output waveform bypasses one stage of filtering. This results in a stronger drive signal to the Phaser Lamp Drivers.

Q81-Q82 LESLIE & MAIN PHASER LAMP DRIVERS

These two opposite polarity (NPN, PNP) transistors alternately conduct at the rate of the Multi-Channel Chorus Oscillator drive signal. As they conduct the lamps connected to their collectors alternately light, illuminating their photocells.

Q72-Q74, Q83-Q85 LESLIE/MAIN PHASERS

#1, #2 & Emitter Followers

All Flute and Reed/String channel audio signals from the Main and Flute and Reed/String Preamps are connected to, and pass through, these circuits. Turning on Multi-Channel Chorus allows the photocell lamps to alternately light, illuminating the photocells causing them to conduct. When the photocells are conducting, signal flow through the Phasers is from base to emitter, which is nearly 180° out of phase as compared to the normal signal flow from base to collector. The random and alternate channel changing of phase results in an apparent pitch fluctuation which imitates the effect of a large multi-tone source organ. The phase shifted Flute and Reed/String signals from the Phasers connect to their Emitter Follower circuits. The emitter follower output connects to the Main and Leslie Mixing Preamp circuits.

AMPLIFIERS

(Refer to Drawing No. 7)

Q89-Q104 MAIN & LESLIE AMPLIFIERS

The circuits in these two amplifiers are direct coupled and identical in operation. The function of the Preamp and Voltage Amp is to boost the signal voltages to a point where they can be used by the Driver and Pre-Driver circuits. The Pre-Driver inverts the audio voltages so that the Drivers work in push-pull. The Output Transistors convert the audio voltages from the Drivers into a high current low voltage output signal that is connected via the headphone jack to the speakers. Also, output signal from each amplifier is mixed and connected to the Cassette Recorder on models so equipped.

POWER SUPPLY

(Refer to Drawing No. 8)

Positive and negative D.C. supply voltages are produced using Transformer T1, Diodes D42 & D47/D43 & D46, D44 & D45 and D69 & D70 plus several resistors and filter capacitors. These D.C. voltages are supplied to the various circuits of the organ as indicated. Zener Diodes Z2, Z3, Z4, Z6, Z7 & Z11 are used as voltage regulators on several voltages also. The Internal Leslie motors are connected across the primary of the power transformer T1 (ahead of the main power fuse) in series with a 5 Amp Slo-Blo fuse.

A 2 Amp fuse is also included in the D.C. supply circuit connected to Repeat. This is done to prevent component damage in the event of a short circuit.

Q111 CASSETTE POWER REGULATOR

This transistor and the Zener Diode attached to its base insure that a constant +8 volts is always supplied to the Cassette Recorder speed control. Adjusting the Cassette Speed Control varies the voltage supplied to the Cassette Recorder between +7 and +8 volts.

GOLDEN HARP

(Refer to Drawing No. 10)

Q105 RAMP KEYER

When the Golden Harp footswitch is off, this transistor continuously conducts, thus applying a strong positive voltage to the Ramp Generator Q106. This positive voltage insures that the Ramp Generator is normally in its off state. Depressing the Golden Harp footswitch applies positive voltage to the Ramp Keyer causing it to stop conducting, thus allowing the Ramp Generator to start conducting.

Q106 RAMP GENERATOR

This transistor starts to conduct when the Ramp Keyer Q105 ceases to conduct. The speed at which the Ramp Keyer goes from zero to full conducting is controlled by the Golden Harp speed control VR11. It is the gradual rise of voltage at the collector of this transistor that controls the Ramp Driver Q108.

Q107 RAMP RESET

Upon releasing the Golden Harp footswitch, positive voltage is applied to this transistor. This voltage causes the transistor to conduct, thus removing any ramp voltage remaining at the collector of the Ramp Keyer Q106.

Q108 RAMP DRIVER

This transistor supplies positive voltage in a gradually increasing amount, as determined by the Ramp Generator, to the Ramp Switchers I through XII.

Q109 RAMP SWITCHERS I - XII

These transistors conduct in order from 1 to 12 as the ramp voltage from the Ramp Driver gradually increases. The more diodes there are connected to the emitter of the transistors, the more the ramp voltage has to be before the Ramp Switcher will conduct. As each Ramp Switcher conducts, it grounds the capacitor connected to its collector. It is the grounding of this capacitor that momentarily causes the Golden Harp Keyers connected to the capacitor to conduct.

CIRCUIT DESCRIPTION

Q110 GOLDEN HARP KEYERS

Positive voltage is applied to the emitters of these transistors via the A.O.C. Intelligence Keyswitches. When the base of the Keyer transistor is momentarily grounded by the Ramp Switchers Q106, the Keyer transistors conduct.

As Keyer transistors conduct, the positive voltage at their emitters is applied to the appropriate upper manual keyswitches, creating the automatic arpeggio effect.

BRASS SYMPHONIZER

(Refer to Drawing No.11)

Q115, Q116, Q117, Q118 TREMOLO OSCILLATOR, SWITCHER & BRASS BUSS DRIVER

The Tremolo Oscillator (Q115 & Q116) creates an alternating voltage. The speed at which this voltage alternates is controlled by the Tremolo Slow/Fast control VR16 and its amount or amplitude (depth) is controlled by Tremolo Off/Full control VR15. This alternating voltage is also influenced by the Wow Wow Full Tabswitch and the Tremolo Switcher Transistor (Q117). When the Wow Wow Full Tabswitch is in the on position, a strong positive voltage is applied to the output of the Tremolo Oscillator which overrides the alternating voltage and cancels Tremolo. When the Krumet Horn preset is pressed, some of the output of the Tremolo Oscillator will be grounded through the Tremolo Switcher (Q117). Meanwhile, a steady positive voltage is supplied through Diode D55 which changes the amplitude of the alternating voltage, thus producing proper Krumet Horn voicing. After the output of the Tremolo Oscillator has been altered by various tabs and controls, it is then applied to the base of the Brass Buss Driver (Q118) which conducts, supplying voltage to the Upper Manual Brass and Wow Wow Keyswitches.

Q119-Q128 LATCHING TRANSISTORS

When a brass preset is pressed, it momentarily applies a positive voltage to the base of its NPN Latching Transistor. This positive voltage causes it to conduct, which lowers the voltage at its collector. The drop in voltage causes the PNP Transistor connected at the NPN's collector to conduct, applying a constant positive voltage to the base of the NPN, thus keeping it on. When the NPN conducts, the positive voltage at its emitter is applied to the base of its associated lamp driver (Q129-Q133).

Q129-Q133 LAMP DRIVERS

Positive voltage received from one or more of the NPN latching transistors (Q120, etc.) causes these transistors to conduct, grounding one side of the preset indicator lamp, allowing it to light. The Lamp Driver Transistors also ground the base of its respective Switcher Transistors (Q148, etc.). This causes the Switcher Transistor to cease conducting, removing ground from the brass voicing circuit, allowing signal to pass from the Brass Collector Preamp and Emitter Follower (Q146, Q147) to the Output Preamp Q156.

Q134, Q135 LATCHING CANCEL TRIGGER

When a brass preset button is pressed, a negative going pulse is received at the base of Q134 from the common preset indicator lamp supply line. This causes Q134 to conduct, providing a momentary positive voltage to the base of the PNP Latching Transistors unlatching any previously latched preset. This positive voltage is also applied to the base of Q135 causing it to conduct, thus holding Q134 on longer and insuring a strong cancel pulse to the latching circuits.

Q136, Q137 & Q138 RELAY SWITCHERS & DRIVER

When a brass preset button is pressed, it lowers the positive voltage at the base of Relay Switcher #1 (Q138) causing it to conduct and apply positive voltage to either ground through Relay Switcher #2 (Q137) or to the base of Relay Driver Q136 (when Relay Switcher #2 Q137 is not conducting). When the Upper Manual Cancel Preset is pressed, a positive voltage is applied to the base of lamp driver Q133 causing it to conduct which results in the grounding of one side of the indicator lamp and the base of Relay Switcher #2 Q137. The grounding of Q137's base causes it to cease conducting, allowing the positive voltage from Relay Switcher #1 (Q138) to be applied to the base of the Relay Driver (Q136). The positive voltage at the base of the Relay Driver causes it to conduct, grounding the Relay and allowing it to operate. When the Relay operates, it interrupts pulses #1 & 2 (B+) of the Upper Manual DC Keyswitches and grounds out the 2-2/3's audio groups, thus cancelling the upper manual voices.

Q145 BRASS KEYER (1 of 61)

This circuit consists of D57, D58 & D145 and is keyed with a positive voltage from the keyswitch, allowing signal from the Tone Generators to pass through the circuit to the Brass Collector Preamp (Q146) and Brass Collector Emitter Follower (Q147).

Q146 & Q147 BRASS COLLECTOR PREAMP & EMITTER FOLLOWER

Signal from Brass Keyer Q145 is amplified by Q146 & Q147 and applied to the Brass and Wow Wow Voicing circuits.

Q149, Q151, Q153, Q155 BRASS VOICING AMPS

The signal from Q146 & Q147 is amplified again by the Brass Voicing Amps. This signal is then applied as output to their respective Brass Voicing circuits.

Q156 & Q157 OUTPUT PREAMP & EMITTER FOLLOWER

The signal from the various Brass Voicing circuits and Wow Wow is amplified and connected as output to the Main Preamps Q62, Q63 and Reverb Driver Q64. The Brass and Wow Wow volume is controlled by Volume Control VR19 which is connected in series with the Emitter Follower and Output Preamp circuits.

WOW WOW

(Refer to Drawing No.11)

WOW WOW KEYING

When an upper manual key is pressed, a positive voltage from Brass & Wow Wow Keyswitches is applied to the base of the Wow Wow Key Down Detector (Q139) causing it to conduct grounding the bases of the Wow Wow Inverter & Reset #2 (Q140 & Q143) which then cease to conduct. When the Wow Wow Inverter ceases to conduct, it allows a positive voltage to be applied to Reset #1 (Q141) which also ceases to conduct. As a result of Q140, Q141 & Q143 ceasing to conduct, the 3 microfarad capacitor at the base of the Integrator Transistor (Q142) discharges causing the Integrator to conduct. The rate at which the 3 microfarad discharges is controlled by the Attack Control VR17. When the Integrator Transistor conducts, it applies voltage to the base of the LED Driver while charging the .47 capacitor at its base. This causes the LED Driver to conduct, lighting the light-emitting diode in Photocell P6. The rate at which the .47 capac-

CIRCUIT DESCRIPTION / ADJUSTMENTS

itor discharges is controlled by the Decay Control VR18. Also, when the Integrator Transistor (Q142) conducts it applies a positive voltage to the base of Reset #1 (Q141) to insure it does not conduct.

Q158 WOW WOW PREAMP

Changes its resonant frequency as light emitting diode lights and photocells in P6 conduct. Output is connected to Q159.

Q159 WOW WOW OUTPUT AMP

Amplifies signal from Q158 and applies it as output to the Output Preamp Q156 and Output Emitter Follower Q157.

AUTOMATIC ORGAN COMPUTER (Refer to Drawing No. 9)

Automatic Organ Computer (A.O.C.) consists of two switching circuits — A.O.C. Keyswitches and Intelligence Keyswitches. In addition, 41 isolation diodes are used to prevent cross-keying when chords are played on the Upper Manual with Sustain. Listed below is an example of what happens when a C Major chord is held on the Lower Manual and the C4 Upper Manual key is pressed.

1. With the A.O.C. tabswitch on, hold a C Major chord (C, E and G) on the Lower Manual. This applies B+ keying voltage from the Intelligence keyswitches to all of the C, E and G A.O.C. keyswitch on busses via isolation diodes.
2. Upon pressing the Upper Manual C4 key
 - (a) The C4 Upper Manual D.C. keyswitch, as well as the nine A.O.C. keys, makes contact with the respective on busses.
 - (b) The C4 keyswitch contact receives B+ keying voltage from its on buss and thus keys the C4 note.
 - (c) Two of the nine (E3 and G4) A.O.C. keys contact on busses that have B+ keying voltage applied to them from the Intelligence keyswitches. This B+ keying voltage is applied to the off busses of the E3 and G4 Upper Manual D.C. keys, thus keying E3 and G4 along C4.

ADJUSTMENTS

VR1 VIBRATO SLOW SPEED ADJUSTMENT

Vibrato slow speed may be adjusted using a small Phillips screwdriver. Proper speed is between 5-6 Hertz with the Vibrato speed tabswitch in the Slow position. Always adjust vibrato slow speed before adjusting fast speed. The Vibrato Oscillator will not oscillate if adjustment is extreme.

VR2 VIBRATO FAST SPEED ADJUSTMENT

Vibrato fast speed may be adjusted using a small screwdriver. Proper speed is between 6-7 Hertz with the Vibrato speed tabswitch in the Fast position. Always adjust vibrato slow speed before adjusting fast speed. The Vibrato Oscillator will not oscillate if adjustment is extreme.

VR3 REPEAT SPEED ADJUSTMENT

Repeat speed may be adjusted using a small regular screwdriver. When adjusting, take into consideration customer preference.

VR6 PERCUSSION ADJUSTMENT

The length of the Percussion sustain may be adjusted while a key is held down by using a small regular screwdriver. Proper length is about 2½ to 3 seconds. Take into consideration customer preference.

VR9-VR10 LESLIE & MAIN PHASER ADJUSTMENT

These adjustments are carefully set at the factory! Readjustment should only be necessary when circuit components are replaced. Refer to the Lowrey Repair Procedures Manual for complete Multi-Channel Chorus repair and adjustment procedures.

L1 TUNING ADJUSTMENT

This adjustment is carefully set at the factory. Should tuning be necessary, refer to the Lowrey Repair Procedures Manual.

TROUBLESHOOTING GUIDE

Q1 VIBRATO OSCILLATOR

No Vibrato

Q2 VIBRATO EMITTER FOLLOWER

No Vibrato

Q3 MASTER OSCILLATOR

All notes of a given tone (C for example), are dead or out of tune.

Q4 BUFFER

All notes of a given tone (C for example), are dead or out of tune.

Q5 WAVESHAPER

1. 2' tabs; 3rd octave of a given note (C for example), dead, weak or garbled.
2. 4' tabs; 4th octave of a given note (C for example), dead, weak or garbled.
3. 8' tabs; 5th octave of a given note (C for example), dead, weak or garbled.
4. 16' tabs; 6th octave of a given note (C only), dead, weak or garbled.

1ST DIVIDER

1. All notes of a given tone (C for example), are dead or out of tune.
2. 2' tabs; 1st, 2nd and 3rd octave of a given note (C for example), dead or weak.
3. 4' tabs; 1st, 2nd, 3rd and 4th octave of a given note (C for example), dead or weak.
4. 8' tabs; 1st, 2nd, 3rd, 4th and 5th octave of a given note (C for example), dead or weak.
5. 16' tabs; 1st, 2nd, 3rd, 4th, 5th and 6th octave of a given note (C for example), dead or weak.

2ND DIVIDER

1. 2' tabs; 1st two octaves of a given note (C for example), dead or weak.
2. 4' tabs; 1st three octaves of a given note (C for example), dead or weak.
3. 8' tabs; 1st four octaves of a given note (C for example), dead or weak.
4. 16' tabs; 1st five octaves of a given note (C for example), dead or weak.
5. 16' Pedal of a given note (C for example), dead or weak.
6. 8' Pedal of a given note (C for example), dead or weak.

3RD DIVIDER

1. 2' tabs; 1st octave of a given note (C for example), dead or weak.
2. 4' tabs; 1st two octaves of a given note (C for example), dead or weak.
3. 8' tabs; 1st three octaves of a given note (C for example), dead or weak.
4. 16' tabs; 1st four octaves of a given note (C for example), dead or weak.
5. 16' and 8' Pedals on 1st two octaves of a given note (C for example), dead or weak.

4TH DIVIDER

1. 2' tabs; 1st octave of a given note (C for example), dead or weak.
2. 4' tabs; 1st two octaves of a given note (C for example), dead or weak.
3. 8' tabs; 1st three octaves of a given note (C for example), dead or weak.
4. 16' tabs; 1st four octaves of a given note (C for example), dead or weak.
5. 16' and 8' Pedals on 1st two octaves of a given note (C for example), dead or weak.

5TH DIVIDER

1. 8' tabs; 1st octave dead or weak (C only).
2. 16' tabs; 1st and 2nd octave dead or weak (C only).

Q13 REPEAT MULTIVIBRATOR

No Marimba repeat and every other group of 3 notes is dead or weak on upper keyboard with repeat off or on.

Q14 REPEAT MULTIVIBRATOR

No Marimba repeat and every other group of 3 notes is dead or weak on upper keyboard with repeat off or on.

Q15 PULSE SHAPER #1

Repeat works on every other upper keyboard 3-note group.

Q16 PULSE SHAPER #2

Repeat works on every other upper keyboard 3-note group.

Q17 PULSE DRIVER #1

Repeat works on every other upper keyboard 3-note group.

Q18 PULSE DRIVER #2

Repeat works on every other upper keyboard 3-note group.

Q19 PULSE KEYER #1

Repeat works on every other upper keyboard 3-note group.

Q20 PULSE KEYER #2

Repeat works on every other upper keyboard 3-note group.

Q21 UPPER MANUAL 8' COLLECTOR PREAMP

1. Trumpet 8', Oboe 8', Kinura 8' and Violin 8', dead or weak.
2. Reed String 4' Coupler dead or weak.
3. Trombone 16' and Cello 16' lack highs.

Q22 UPPER MANUAL EMITTER FOLLOWER

1. Trumpet 8', Oboe 8', Kinura 8' and Violin 8', dead or weak.
2. Reed String 4' Coupler dead or weak.
3. Trombone 16' and Cello 16' lack highs.

Q23 UPPER MANUAL 16' COLLECTOR PREAMP

1. Trombone and Cello voices sound weak and one octave high (8').

TROUBLESHOOTING GUIDE

2. 16' Clarinet voice is dead.

Q24-Q25 PEDAL CANCEL TRIGGER

1. All pedals rumble, but if one is held down, it sounds normal after 15 seconds.
2. No pedals

Q26 PEDAL CANCEL

Pedals dead

Q27 BASS GUITAR KEYER

1. No Guitar Bass Harmonic.
2. Guitar Bass Harmonic sustains at a constant volume for 10 seconds.

Q28 PEDAL KEYER

1. Pedals sustain at a constant volume for 10 seconds.
2. No pedal except Guitar Bass Harmonic.

Q29 PEDAL KEYER Emitter FOLLOWER

1. Pedals sustain at a constant volume for 10 seconds.
2. No pedal except Guitar Bass Harmonic.

Q30-Q31 1ST PEDAL DIVIDER

Dead pedals, rumble in all pedals, or pedal tone one octave high.

Q32-Q33 2ND PEDAL DIVIDER

No Pedal 16', rumble in all pedals 16' only.

Q34 LOWER KEYBOARD REED STRING COLLECTOR PREAMP

Violin 8', Cornet 8', French Horn 8' and English Horn 8' dead or weak.

Q35 150 CYCLE FILTER

1. Upper keyboard 16' Flute C1 thru F#3 dead or weak.
2. Upper keyboard 8' Flute C1 thru F#2 dead or weak.

Q36 212 CYCLE FILTER

1. Upper keyboard 16' Flute G3 thru C4 dead or weak.
2. Upper keyboard 8' Flute G2 thru C3 dead or weak.
3. Lower keyboard 8' Flute C1 thru C3 dead or weak.

Q37 300 CYCLE FILTER

1. Upper keyboard 16' C# 4 thru F# 4 dead or weak.
2. Upper keyboard 8' Flute C#3 thru F#4 dead or weak.
3. Upper keyboard 4' Flute C1 thru F#2 dead or weak.
4. Lower keyboard 8' Flute C#3 thru F#3 dead or weak.

Q38 425 CYCLE FILTER

1. Upper keyboard 16' Flute G4 thru C5 dead or weak.
2. Upper keyboard 8' Flute G3 thru C4 dead or weak.
3. Upper keyboard 4' Flute G2 thru C3 dead or weak.
4. Upper keyboard 2-2/3' Flute C1 thru F2 dead or weak.
5. Lower keyboard 8' Flute G3 thru C4 dead or weak.

Q39 600 CYCLE FILTER

1. Upper keyboard 16' Flute G4 thru F#5 dead or weak.
2. Upper keyboard 8' Flute C#4 thru F#4 dead or weak.
3. Upper keyboard 4' Flute C#3 thru F#3 dead or weak.
4. Upper keyboard 2' Flute C1 thru F#2 dead or weak.
5. Upper keyboard 2-2/3' Flute F#2 thru B2 dead or weak.
6. Lower keyboard 8' Flute C#4 thru F#4 dead or weak.

Q40 850 CYCLE FILTER

1. Upper keyboard 16' Flute G5 thru C6 dead or weak.
2. Upper keyboard 8' Flute G4 thru C5 dead or weak.
3. Upper keyboard 4' Flute G3 thru C4 dead or weak.
4. Upper keyboard 2' Flute G2 thru C3 dead or weak.
5. Upper keyboard 2-2/3' Flute C3 thru F3 dead or weak.
6. Lower keyboard 8' Flute G4 thru C5 dead or weak.

Q41 1200 CYCLE FILTER

1. Upper keyboard 8' Flute C#5 thru F#5 dead or weak.
2. Upper keyboard 4' Flute C#4 thru F#4 dead or weak.
3. Upper keyboard 2' Flute C#3 thru F#3 dead or weak.
4. Upper keyboard 2-2/3' Flute F#3 thru B3 dead or weak.
5. Lower keyboard 8' Flute C#5 thru F#5 dead or weak.

Q42 1700 CYCLE FILTER

1. Upper keyboard 8' Flute G5 thru F#5 dead or weak.
2. Upper keyboard 4' Flute G4 thru C5 dead or weak.
3. Upper keyboard 2' Flute G3 thru C4 dead or weak.
4. Upper keyboard 2-2/3' Flute C4 thru F4 dead or weak.
5. Lower keyboard 8' Flute G5 thru C6 dead or weak.

Q43 DOUBLER PREAMP

1. Upper keyboard 4' Flute C#5 thru C6 dead or weak.
2. Upper keyboard 2' Flute C#4 thru C6 dead or weak.
3. Upper keyboard 2-2/3' Flute F#4 thru C6 dead or weak.

Q44 425 CYCLE FILTER

1. Lower keyboard Diapason 8' C1 thru C3 dead or weak.
2. Lower keyboard French Horn 8' dead or weak.

Q45 600 CYCLE FILTER

1. Lower keyboard Diapason 8' C#3 thru C4 dead or weak.

Q46 850 CYCLE FILTER

1. Lower keyboard Diapason 8' G3 thru C4 dead or weak.

Q47 1200 CYCLE FILTER

1. Lower keyboard Diapason 8' C#4 thru F#4 dead or weak.
2. Upper keyboard Trumpet 8' dead or weak.
3. Upper keyboard 16' Clarinet lacks highs.

Q48 1700 CYCLE FILTER

1. Lower keyboard Diapason 8' G4 thru C6 dead or weak.
2. Lower keyboard Cornet 8' dead or weak.
3. Lower keyboard English Horn 8' dead or weak.
4. Upper keyboard Oboe 8' dead or weak.

TROUBLESHOOTING GUIDE

Q49 STRING PREAMP

1. Upper keyboard Kinura 8' dead or weak.
2. Upper keyboard Violin 8' dead or weak.
3. Upper keyboard Cello 16' dead or weak.
4. Lower keyboard Violin 8' dead or weak.

Q50 FLUTE PREAMP

1. Upper keyboard 16' Flute dead or weak.
2. Upper keyboard 8' Flute dead or weak.
3. Upper keyboard 4' Flute dead or weak.
4. Upper keyboard 2' Flute dead or weak.
5. Upper keyboard 2 2/3' Flute dead or weak.
6. Lower keyboard 8' Flute dead or weak.

Q51 REED STRING PREAMP

1. Upper keyboard Trombone 16', Clarinet 16', dead or weak.
2. Upper keyboard Trumpet 8', Oboe 8', Kinura 8', Violin 8' and Cello 16' dead or weak.
3. Lower keyboard Diapason 8', Violin 8', Cornet 8', French Horn 8' and English Horn 8' dead or weak.

Q52 PERCUSSION BASS BYPASS

With Percussion tab on, voices percuss completely (no sound after percussion.)

Q53 PERCUSSION MODULATOR

1. No percussion or very weak percussion.
2. No percussion repeat.

Q54 PERCUSSION PREAMP

1. No percussion or very weak percussion.
2. No percussion repeat.

Q55-Q56 PERCUSSION PULSE DETECTORS

No percussion, but repeat works.

Q57-Q58 PERCUSSION MULTIVIBRATOR

No percussion and no repeat, or no repeat but percussion O.K.

Q59 PERCUSSION DRIVER

No percussion or repeat or weak percussion and repeat.

Q60-Q61 LESLIE MIXING PREAMP

All voices dead or weak when in Leslie.

Q62-Q63 MAIN MIXING PREAMP

All voices dead or weak when in Main.

Q64 thru Q68 REVERB DRIVER, PREAMPS, MIXER & Emitter Follower

No Reverb or weak Reverb.

Q71 RHYTHM Emitter Follower

All rhythm voices, reverberation and automatic, dead or weak.

Q72 thru Q85 MULTI-CHANNEL CHORUS AND LESLIE & MAIN PHASERS

Failure of any of the above transistors will cause a change in the amount of Chorus or complete loss of Chorus.

When checking for Chorus, it is best to keep the Leslie from rotating and with no vibrato, check for phase shift.

To repair or adjust, other than complete circuit board replacement, refer to the Lowrey Repair Procedure Manual.

Q89 thru Q96 PREAMP (LESLIE), VOLTAGE AMP, PRE-DRIVER, SHORT CIRCUIT PROTECTOR, DRIVERS & OUTPUTS

Entire organ dead, weak or distorted, and may blow fuses in Leslie position.

Q97 thru Q104 PREAMP (MAIN), VOLTAGE AMP, PRE-DRIVER, SHORT CIRCUIT PROTECTOR, DRIVERS & OUTPUTS

Entire organ dead, weak or distorted in Main position, and may blow fuses.

Q105 RAMP KEYER

No Golden Harp and/or only one note sounds when Golden Harp switch is depressed.

Q106 RAMP GENERATOR

No Golden Harp

Q107 RAMP RESET

Golden Harp does not give full spectrum of chord being played.

Q108 RAMP DRIVER

No Golden Harp

Q109 (12) RAMP SWITCHER

When using Golden Harp, one tone will be silent from the 3-tone sequence. (Example - F1 missing from F2 & F3.)

Q110 (36) GOLDEN HARP KEYERS

One tone missing from 3-tone sequence, or notes will play when keys are depressed on lower keyboard with upper keyboard tabs on. (Golden Harp switch does not have to be activated.)

POWER SUPPLY

D42, D43, D44, D45, D46 & D47

T1 Transformer

1. Entire organ dead, weak, distorted and/or constant power hum.
2. Loss of entire section of organ (example - Reverb, Rhythm, Vibrato etc.)
3. Organ blows fuses.

Q111 CASSETTE POWER REGULATOR

Constant hum, unstable Cassette speed or no Cassette.

Q114 UPPER MANUAL 16' SOLO DIVIDER AND UPPER MANUAL 16' SOLO DIVIDER NETWORK

1. First 12 upper manual notes an octave high on 16'.
2. First 12 upper manual notes dead or weak, or rumble on 16'.

TROUBLESHOOTING GUIDE

Q160, Q161 PEDAL PULSE AMP AND INVERTER

1. Diaphone 16', Diapason 8' and Tuba 8' sustains at a constant volume for 15 seconds.
2. Diaphone 16', Diapason 8' and Tuba 8' dead or weak.

Q162, Q163 8' PEDAL BRASS KEYER AND 8' PEDAL BRASS KEYER EMITTER FOLLOWER

Diapason 8' and Tuba 8' dead or weak.

Q164, Q165 16' PEDAL BRASS KEYER AND 16' PEDAL BRASS KEYER EMITTER FOLLOWER

Diaphone 16' dead or weak.

Q166 150 CYCLE FILTER

1. Bourdon 16' dead or weak.
2. Diaphone 16' has low bass tone missing.

Q167 PEDAL OUTPUT PREAMP

1. Bass tone missing on Bass Guitar.
2. Flute 8', Bourdon 16' and Diapason 8' dead or weak.
3. Diaphone 16' and Tuba 8' missing harmonic.

Q168 150 CYCLE FILTER

1. Bass tone missing on Bass Guitar.
2. Flute 8' and Diapason 8' dead or weak.

PLAY ALONG

REVERBERATING RHYTHM

Q56 PEDAL PULSE AMP

1. No Bass Drum, and constant noise on Brush and Cymbal.
2. No Bass Drum, no Clave and no Brush or Cymbal on Pedals.

Q57 SHIMMER GENERATOR

No Shimmer on Brush when keyed by Pedal.

Q58-Q59 SNARE DRUM & CASTANET KEYERS

1. No Snare roll or Castanets.
2. Castanets and Snare Drum roll play constantly.

Q60-Q61 CASTANET MULTIVIBRATOR

No Castanet roll, or only one beat when key is played.

Q62 BRUSH & SNARE DRUM PULSE AMP

1. No Snare, one-shot, continuous Snare Drum roll and constant Brush sound.
2. No Snare Drum one-shot or keyboard Brush.

Q63 GROUP 1 PULSE DETECTOR

No Tom-Tom, Bongo, Blocks, Brush or Snare one-shot, from A1 to F#1.

Q64 GROUP 2 PULSE DETECTOR

No Tom-Tom, Bongo, Blocks, Brush or Snare one-shot, from G1 to C2.

Q65 GROUP 3 PULSE DETECTOR

No Tom-Tom, Bongo, Blocks, Brush or Snare one-shot, from C#2 to B3.

CLOCK AND MATRIX

Q66 SHIFT REGISTER DRIVER

All rhythms uneven or dead.

Q67 TRIPLET TIMING REGULATOR #1

Rhythm beats slow and tempo changes between Triplet and non-Triplet rhythms.

Q68 TRIPLET TIMING REGULATOR #2

Rhythm timing is unstable.

Q69-Q70 CLOCK MULTIVIBRATOR

No Automatic Rhythms.

Q71 MULTI-STARTER

No Automatic Rhythms.

Q72-Q73 SHIFT REGISTER PROGRAM DIVIDER

No Automatic Rhythm except Swing Waltz and Waltz.

Q74 DIVIDER STARTER

Rhythm beats have no set pattern.

Q75 SHUNT SWITCH #1

Rhythm beats unstable except Swing Waltz and Waltz.

Q76 SHUNT SWITCH #2

Rhythm beats unstable except Swing Waltz and Waltz.

Q77 SHUNT SWITCH #3

Rhythm beats unstable except Dixie, Shuffle, Swing I & II, Swing Waltz and Waltz.

Q78-Q83 SHIFT REGISTER #1 & SHIFT STARTER

Continuous beat on Rhythm voices or Clock does not start its cycle.

Q84-Q93 PULSE AMPS 1,2,3,4 & 5, SHIFT REGISTER #2

Rhythm patterns unstable.

Q94-Q95 LAMP DRIVERS

1. No Downbeat lamp
2. Downbeat lamp not stable
3. Lamp on continuously

Q96-Q118 LOGIC GATES

Incorrect rhythms, and very noticeable on Waltz and Swing Waltz.

INSTRUMENTATION

Q119-Q120 BASS DRUM PULSE AMP & BASS DRUM GENERATOR

1. Missing or weak Bass Drum in Reverberating or Automatic Rhythm.
2. No Bass Drum in Reverberating or Automatic Rhythm.

Q121-Q122 TOM-TOM PULSE AMP & TOM-TOM GENERATOR

Missing or weak Tom-Tom in Reverberating or Automatic Rhythm.

TROUBLESHOOTING GUIDE

Q123-Q124 BONGO PULSE AMP & BONGO GENERATOR

Missing or weak Bongo in Reverberating or Automatic Rhythm.

Q125-Q126 BLOCKS PULSE AMP & BLOCKS GENERATOR

Missing or weak Blocks in Reverberating or Automatic Rhythm.

Q127-Q128 CLAVE PULSE AMP & CLAVE GENERATOR

Missing or weak Clave in Reverberating or Automatic Rhythm.

Q129-Q130 RIM SHOT PULSE AMP & RIM SHOT GENERATOR

Missing or weak Rim Shot and no Metronome in Automatic Rhythm only.

Q131-Q132 HI DRUM PULSE AMP & HI DRUM GENERATOR

Missing or weak HI DRUM in Automatic Rhythm.

Q133-Q134 LO DRUM PULSE AMP & LO DRUM GENERATOR

Missing or weak LO Drum in Automatic Rhythm.

Q135-Q136 SNARE DRUM MULTIVIBRATOR

No Snare Drum, or constant Snare noise.

Q137 SNARE DRUM TRIGGER

No Snare Drum roll and single beat or, continuous Snare roll.

Q138-Q139 BRUSH TRIGGER

No Brush on Automatic Rhythm only, or continuous Brush sound.

Q140 BRUSH NOISE AMP

No Brush on Reverberating Rhythm or Automatic Rhythm.

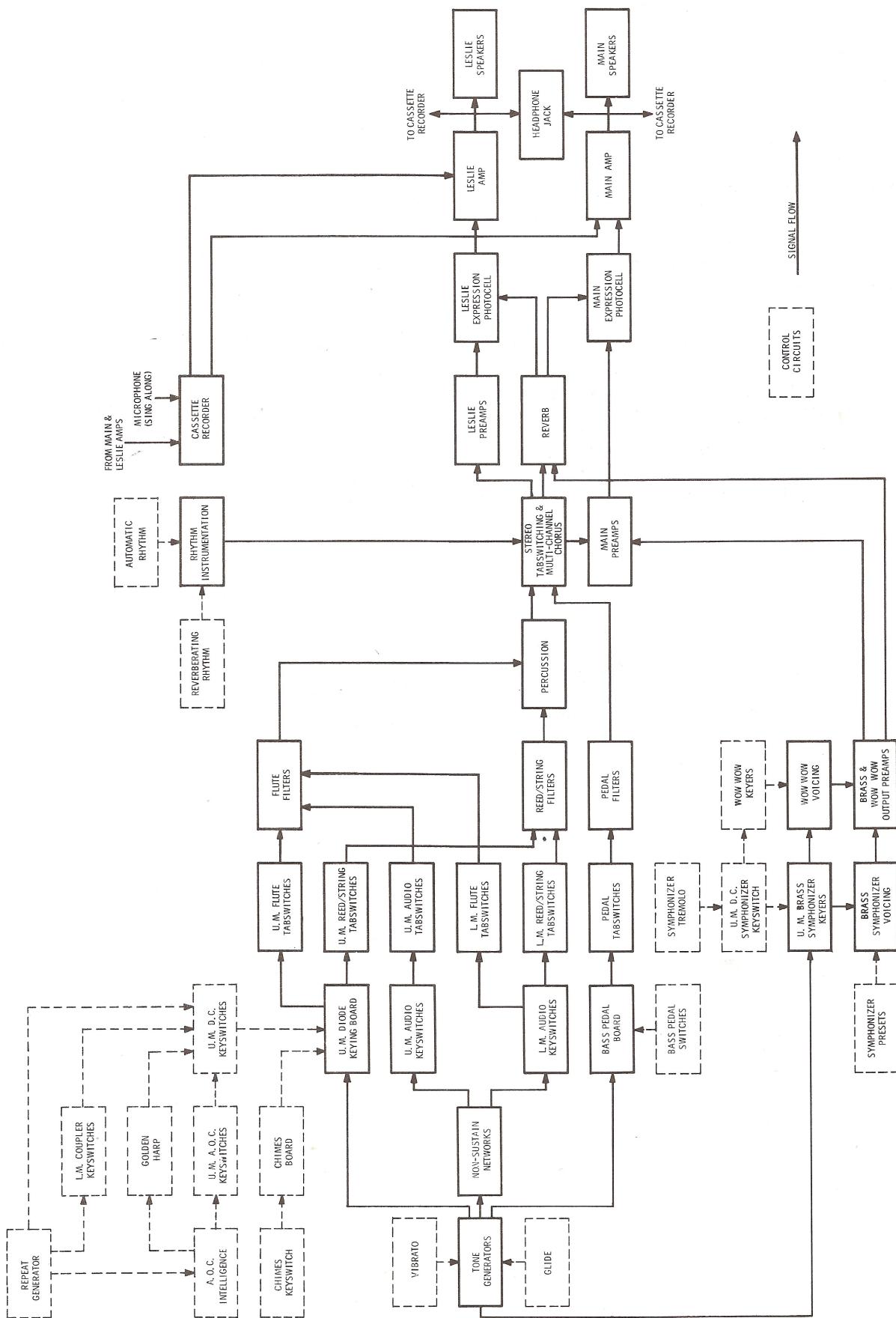
Q141 BRUSH GATE

No Brush on Reverberating Rhythm or Automatic Rhythm.

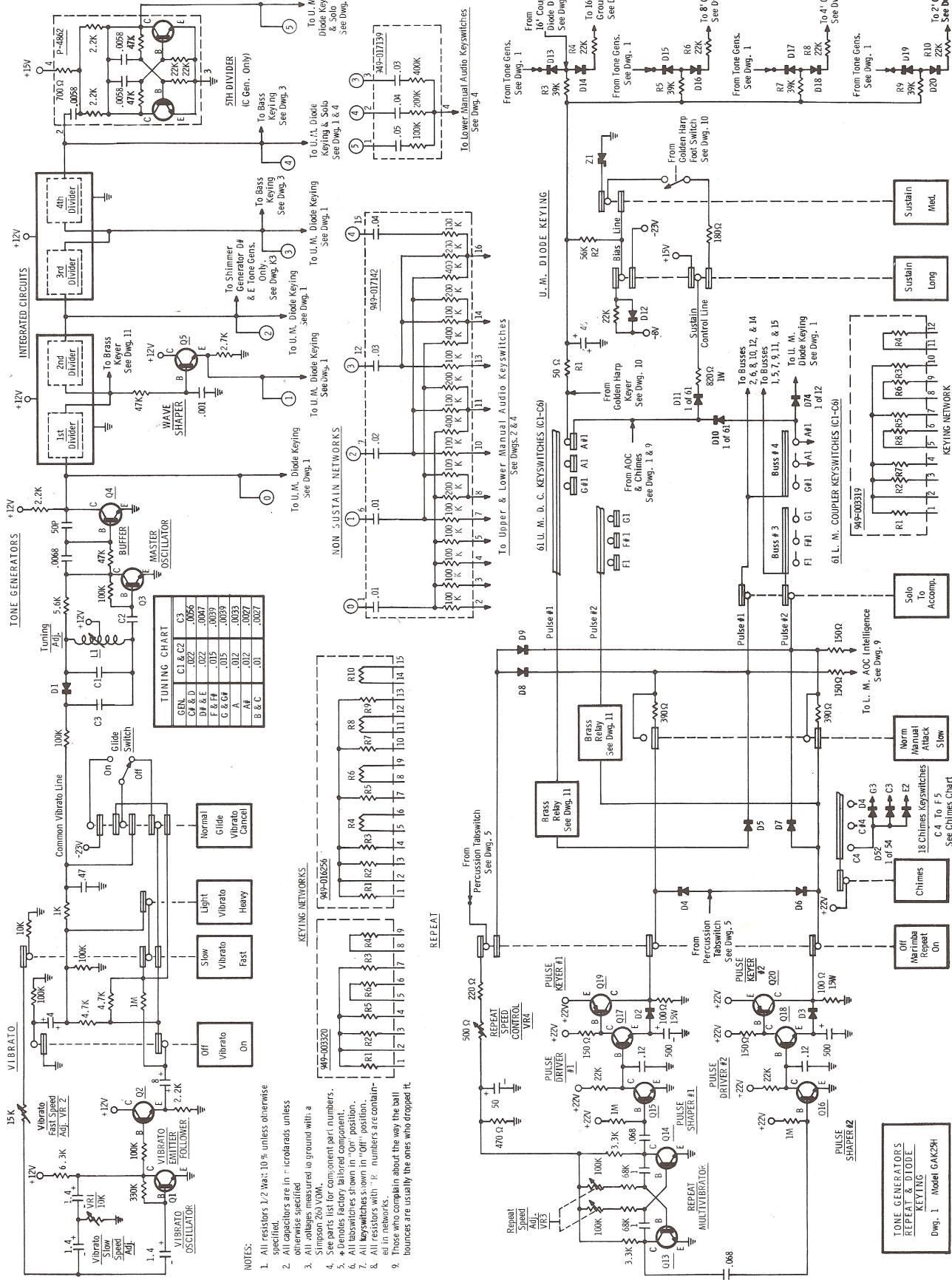
McCOYS ELECTRONIC ORGAN SERVICE

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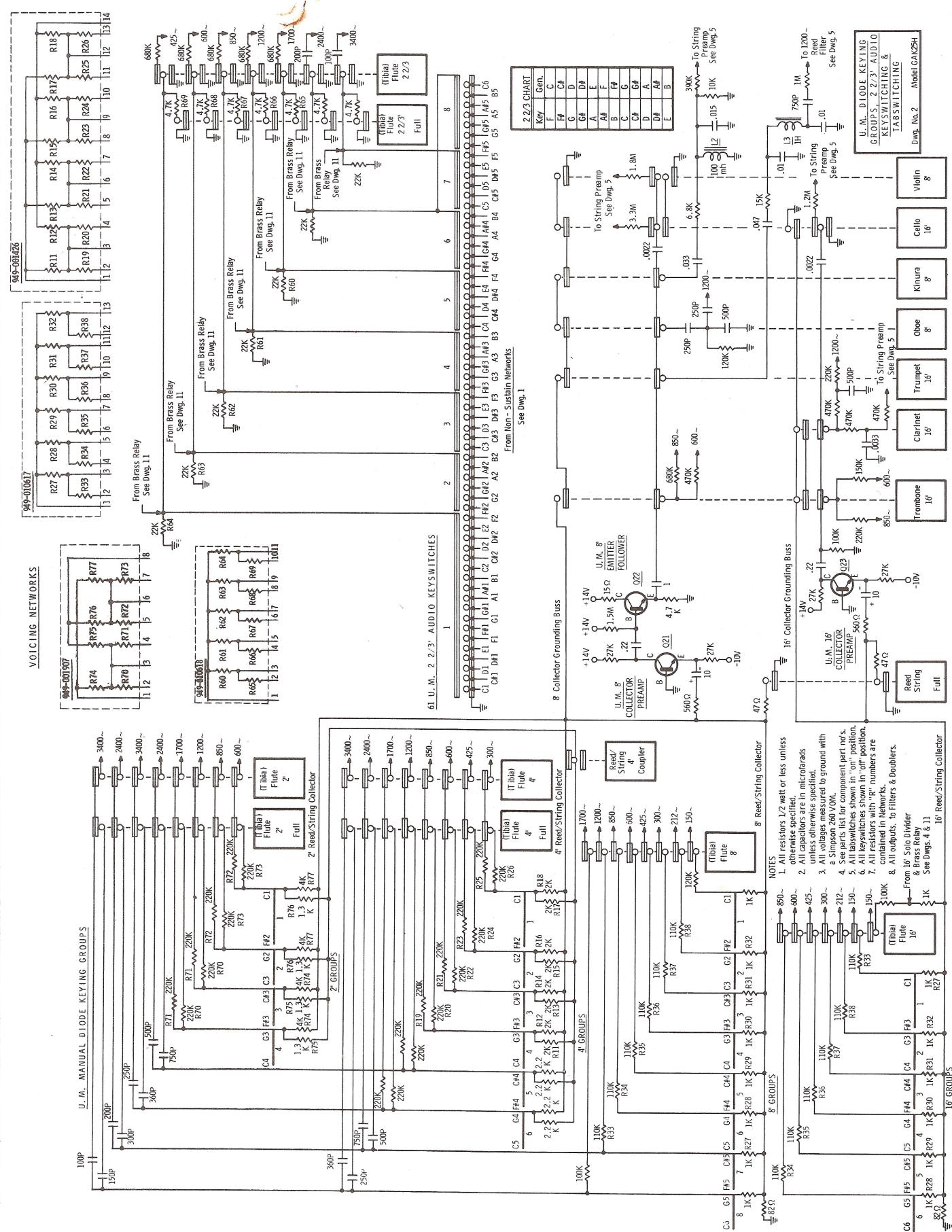
BLOCK DIAGRAM



SCHEMATIC 1

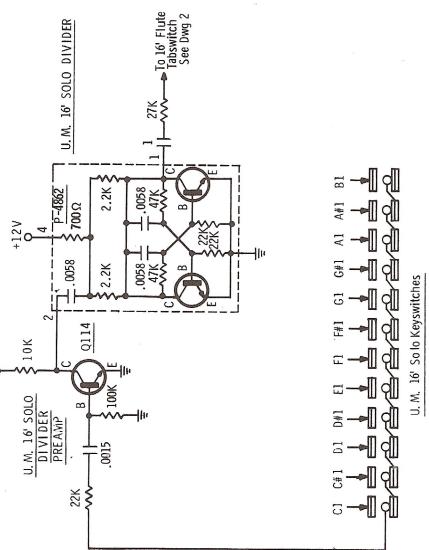


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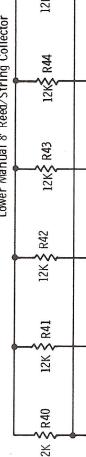


SCHEMATIC 4

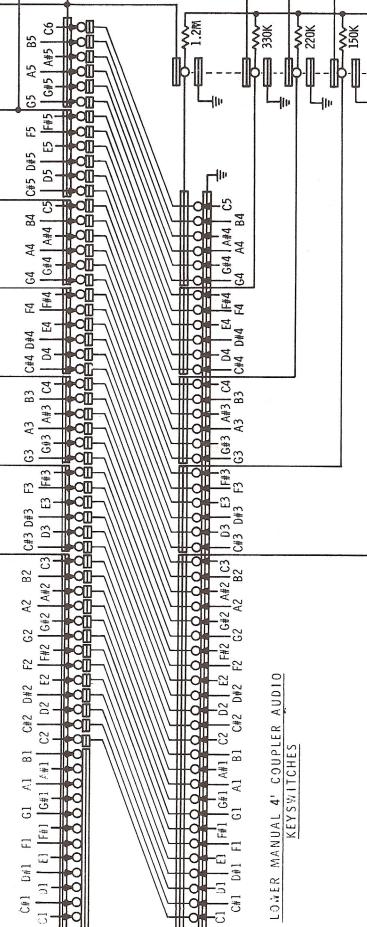
UPPER MANUAL 16' SOLO



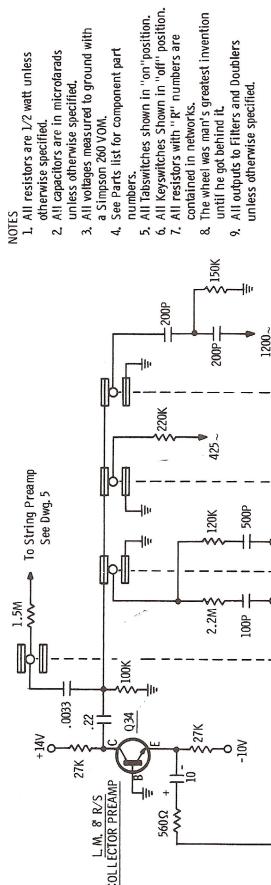
LOWER MANUAL 8' AUDIO KEYSWITCHES



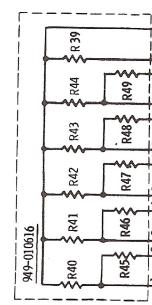
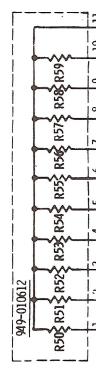
LOWER MANUAL 8' COUPLER AUDIO KEYSWITCHES



COLLECTOR PREAMP



VOICING NETWORKS

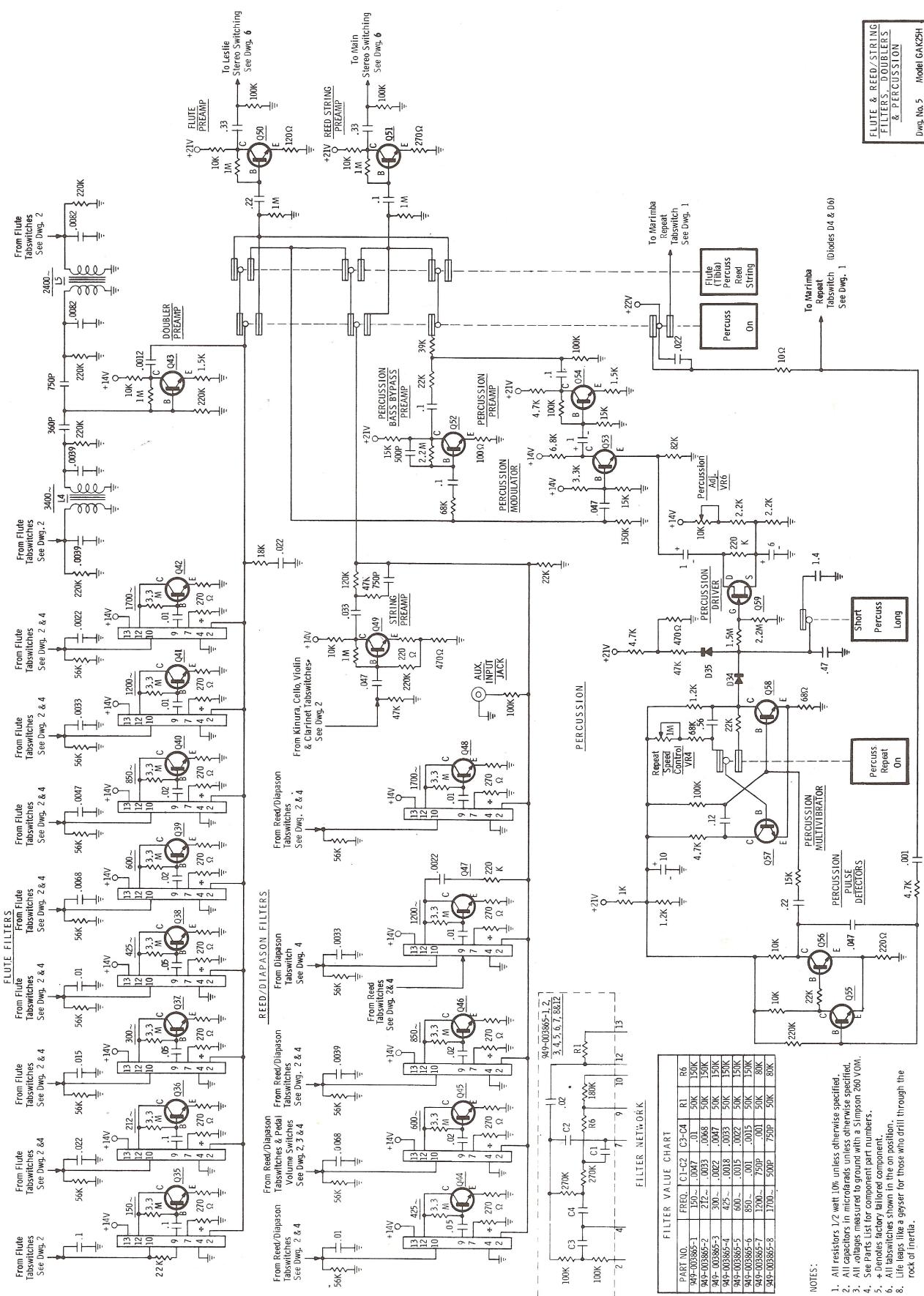


KEYSWITCHES

KEYSWITCHES

UPPER MANUAL 16' SOLO,
LOWER MANUAL KEYSWITCHING
& TABSWITCHING
Dwg. No 4
Model GAK2H

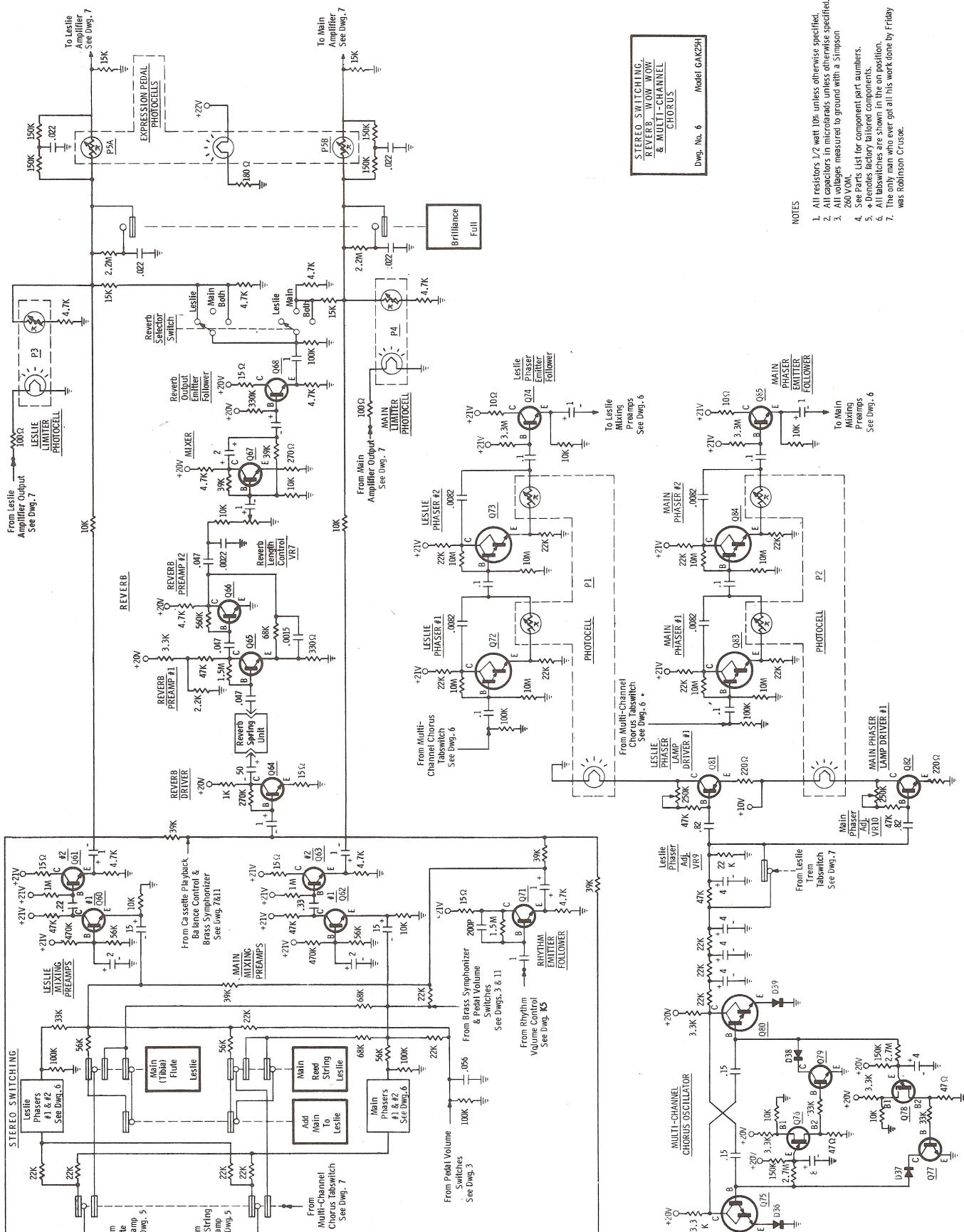
SCHEMATIC 5



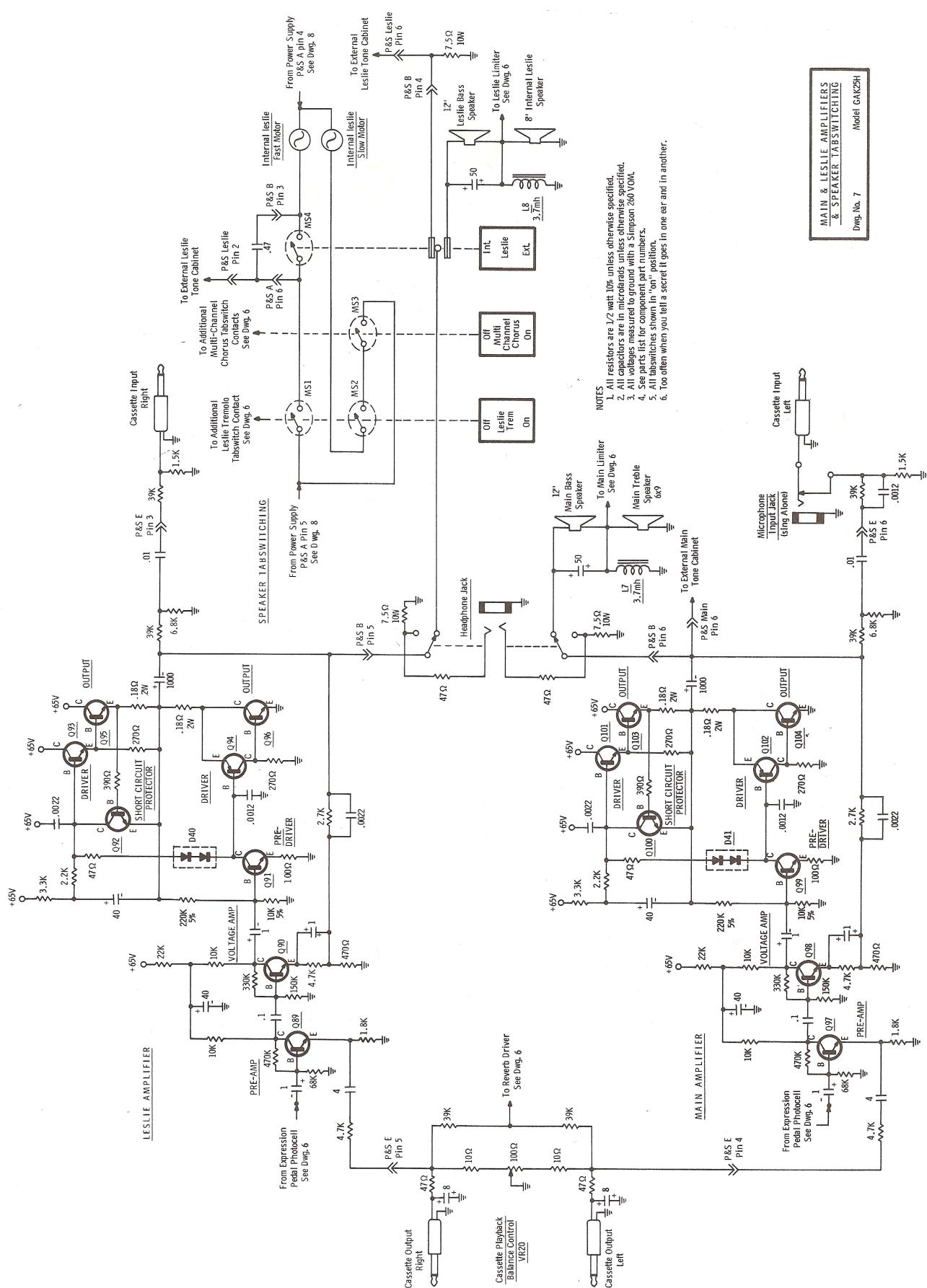
NOTES:

1. All resistors 1/2 watt 10% unless otherwise specified.
2. All capacitors in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 Voltmeter.
4. See Parts List for component part numbers.
5. * Denotes factory tailored component.
6. All switchs shown in the on position.
7. Life spans like a geyser for those who drill through the rock of inertia.

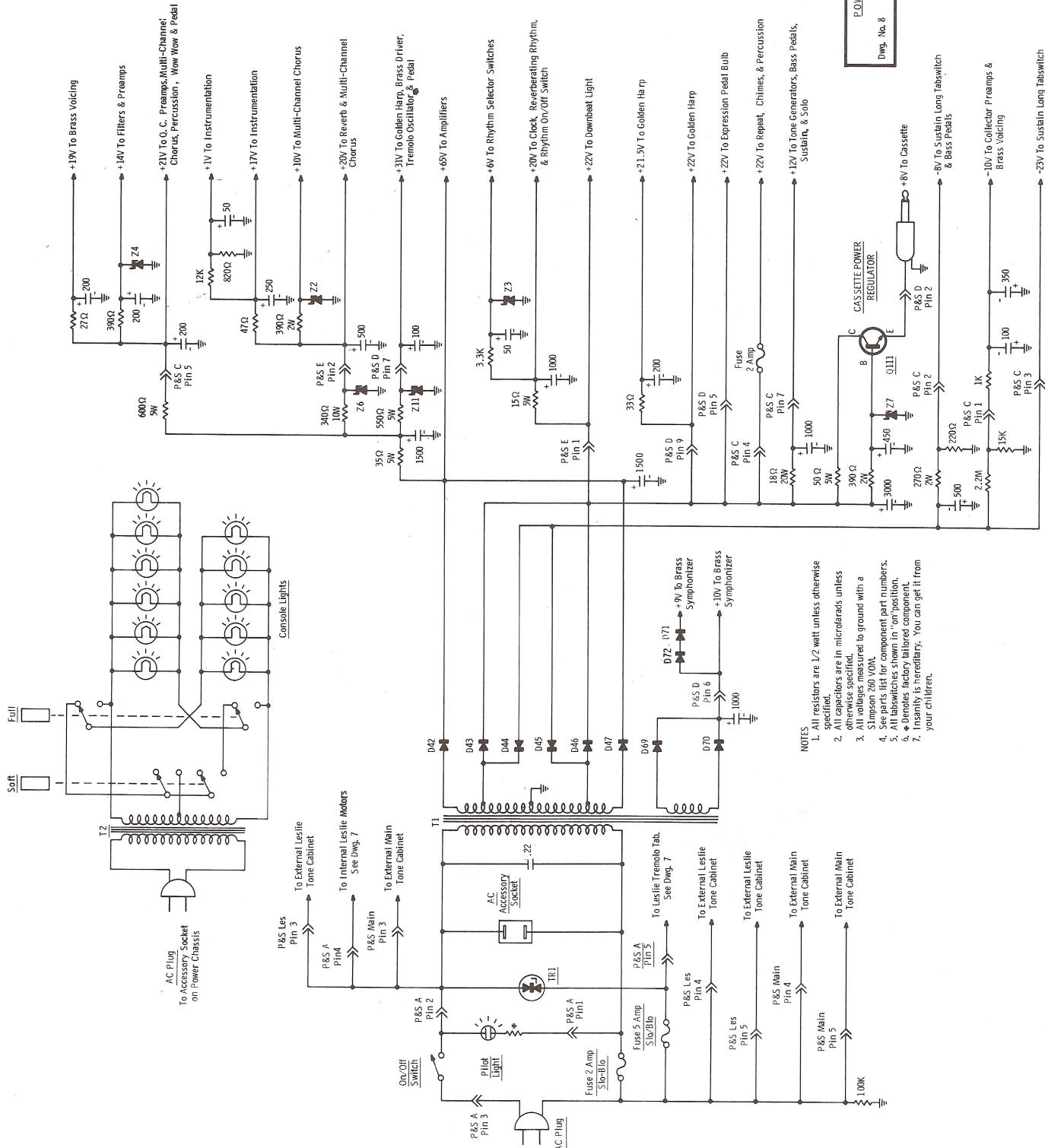
SCHEMATIC 6



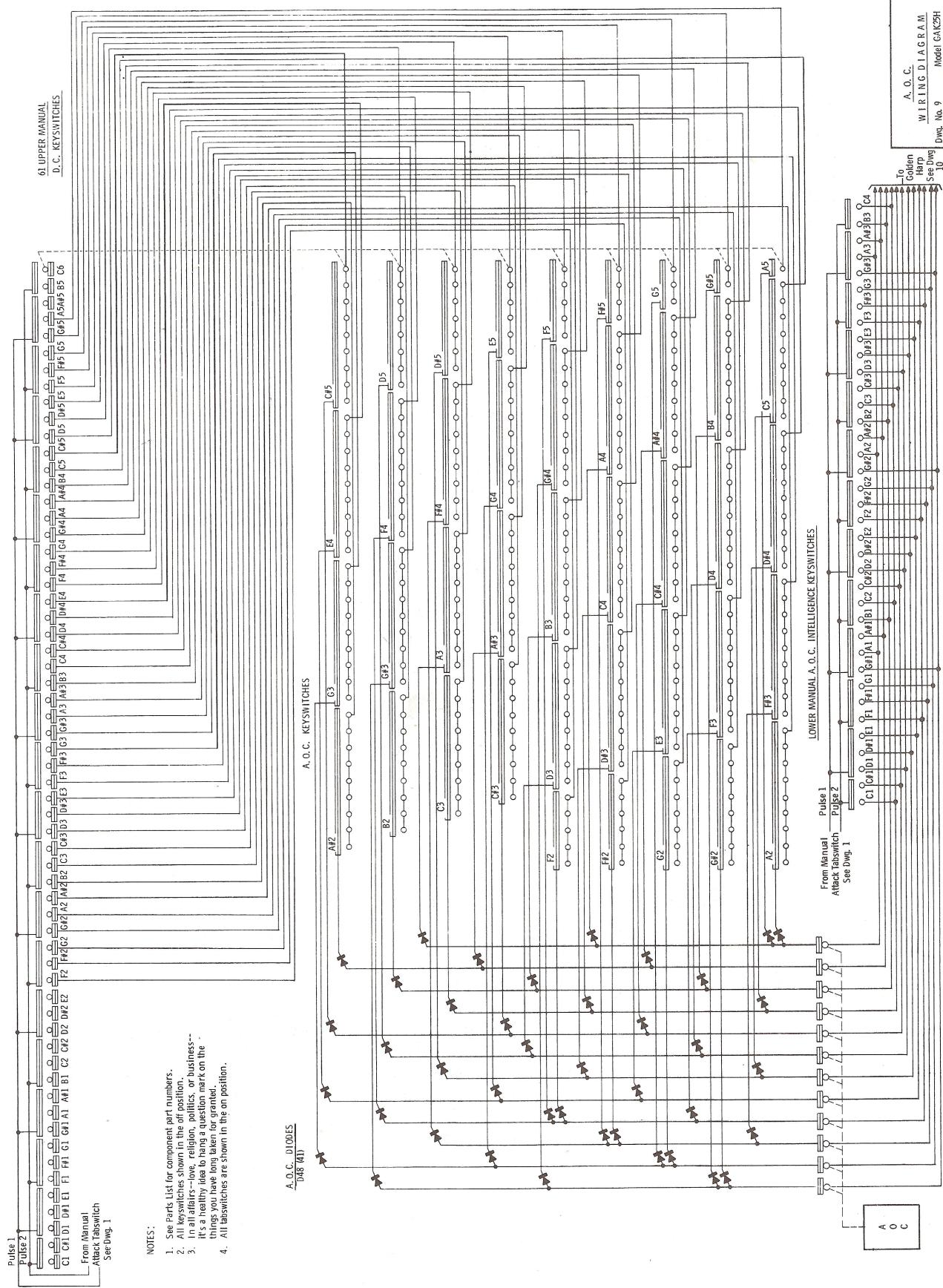
SCHEMATIC 7



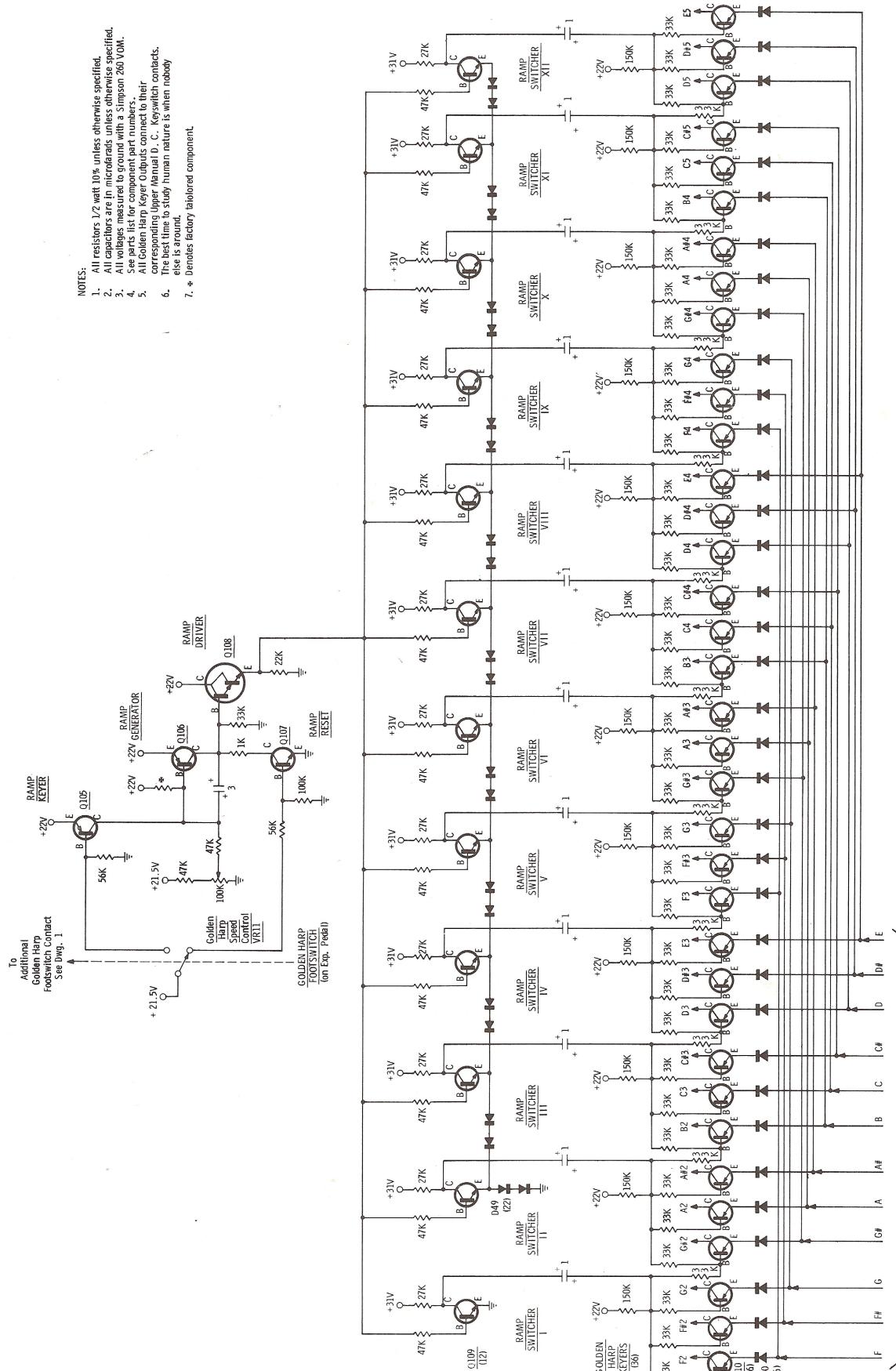
SCHEMATIC 8



SCHEMATIC 9



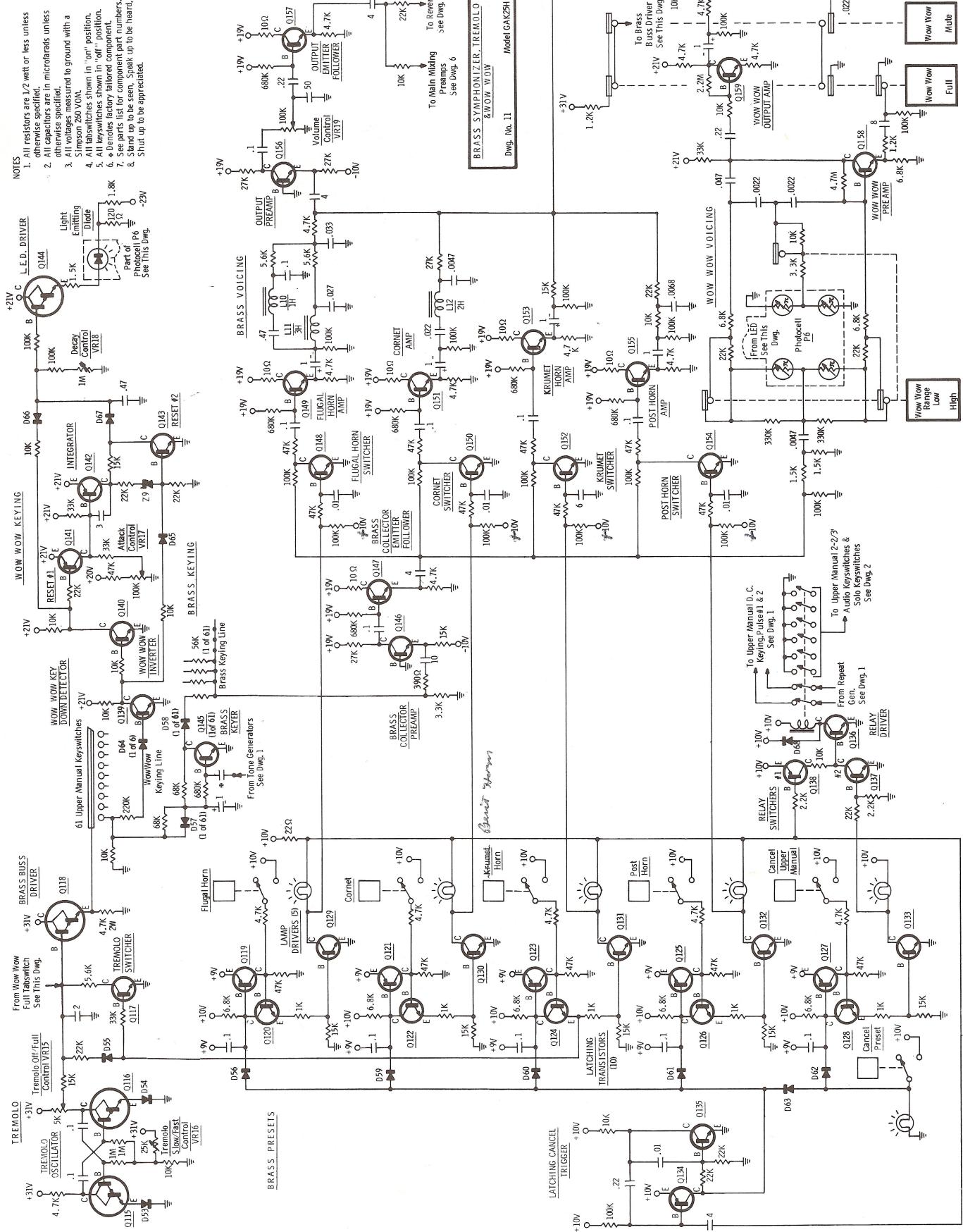
SCHEMATIC 10



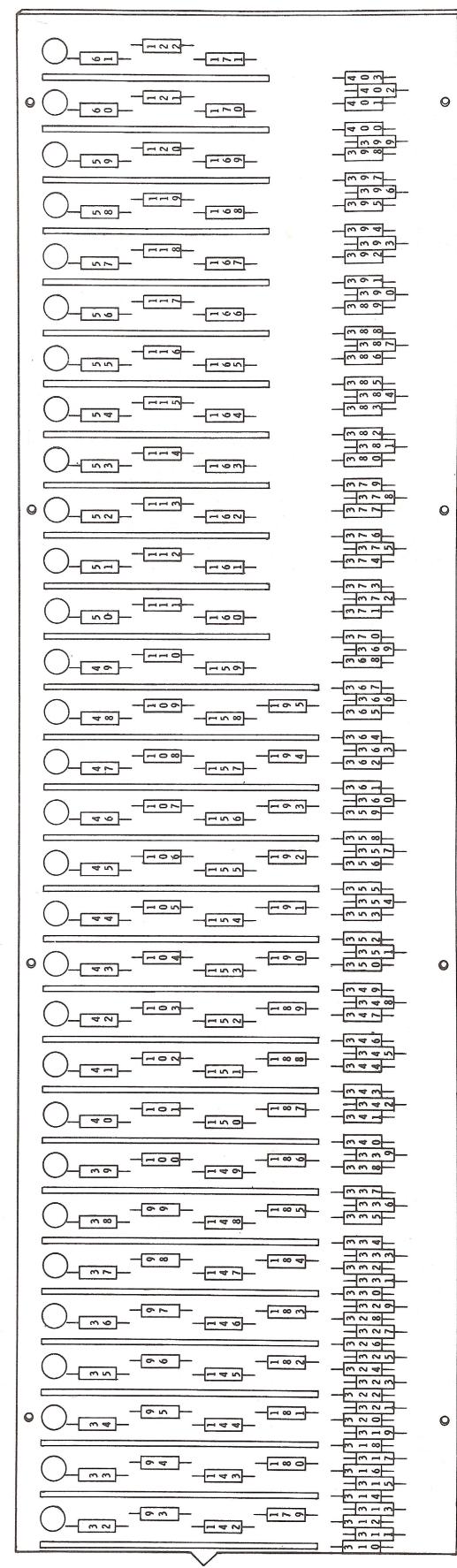
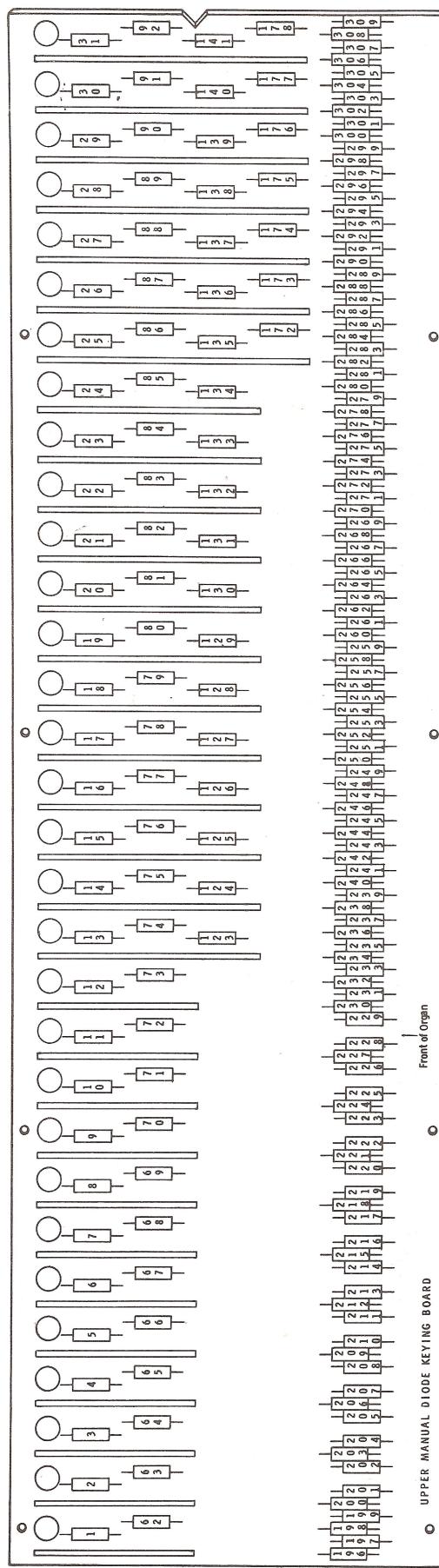
From AOC Intelligence Keyswitches
See Dwg. 9

GOLDEN HARP
Dwg. No. 10 Model GAK2H

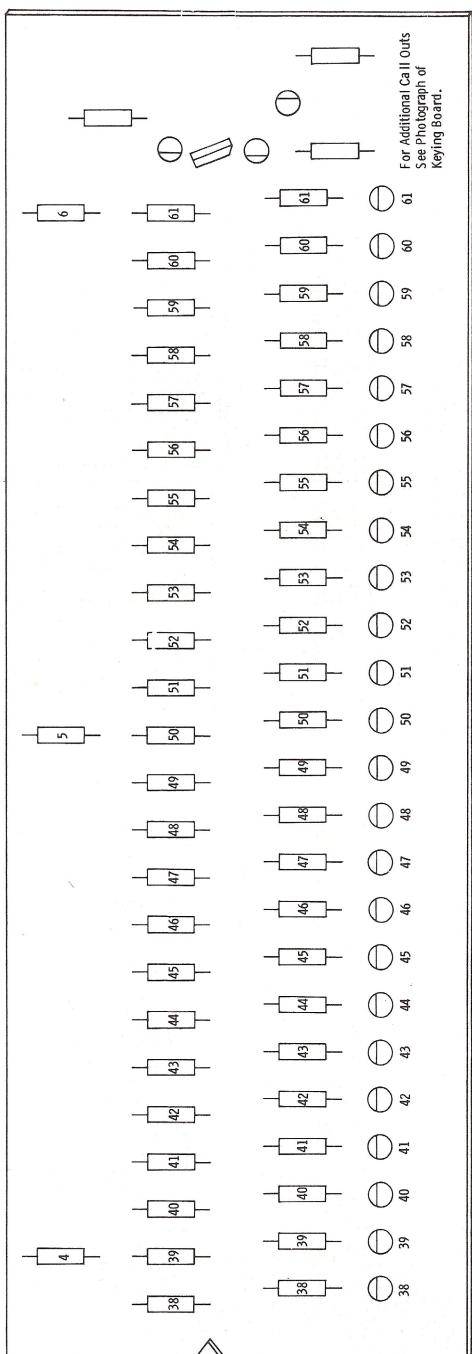
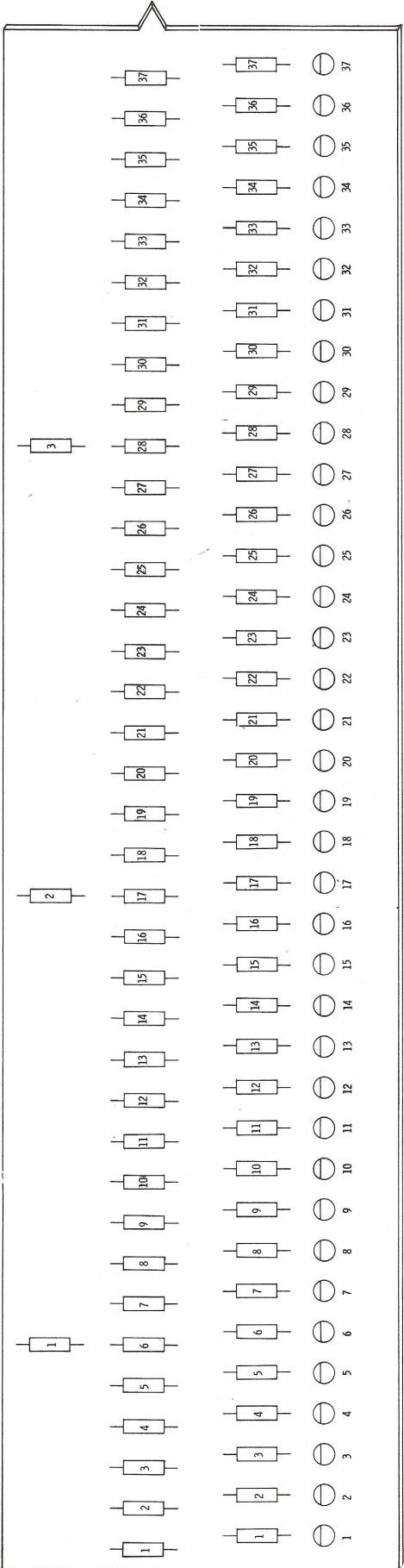
SCHEMATIC 11



CHARTS



CHARTS

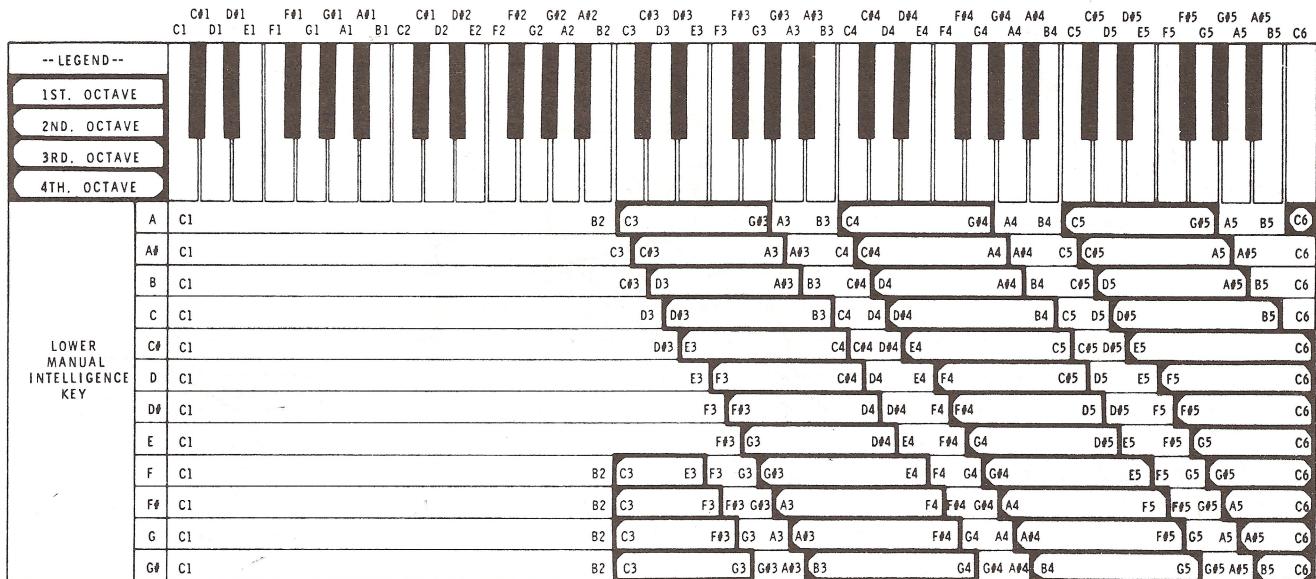


BRASS & WOW WOW KEYING CHART

U.M. KEY	C645	D57	D58	D64
C6	61	61	61	
B5	60	60	60	
A5	59	59	59	
G5	58	58	58	6
F5	57	57	57	
E5	56	56	56	
D5	55	55	55	
C5	54	54	54	
B5	53	53	53	
A5	52	52	52	
G5	51	51	51	
F5	50	50	50	
E5	49	49	49	5
D4	48	48	48	
C4	47	47	47	
B4	46	46	46	
A4	45	45	45	
G4	44	44	44	
F4	43	43	43	
E4	42	42	42	
D4	41	41	41	
C4	40	40	40	
B4	39	39	39	
A4	38	38	38	
G4	37	37	37	
F3	36	36	36	
E3	35	35	35	
D3	34	34	34	
C3	33	33	33	
B3	32	32	32	
A3	31	31	31	
G3	30	30	30	
F3	29	29	29	
E3	28	28	28	
D3	27	27	27	
C3	26	26	26	
B2	25	25	25	
A2	24	24	24	
G2	23	23	23	

For Additional Call Outs
See Photograph of
Keying Board.

A.O.C. KEYING CHART



A.O.C. CHECKOUT PROCEDURE

1. Depress these two tabs only: Upper Manual Flute 8' and A.O.C.
2. Depress one key (A1 for example) in the Lower Manual A.O.C. Intelligence section (A1 through C3).
3. Play each of the keys from C1 through C4 on the Upper Manual. On certain keys, a note—in addition to the normal Upper Manual note—should be heard. This additional note will be, for example, an “A” note if an “A” key is depressed in the Lower Manual Intelligence section. The additional “A” note will be within the octave, but

“below” that Upper Manual key being depressed. Refer to the A.O.C. Keying Chart to determine which notes sound as different Intelligence and Upper Manual keys are depressed.

4. Repeat the above procedure for the remaining notes of the Lower Manual A.O.C. Intelligence section.

IMPORTANT

For A.O.C. to function properly, The A.O.C. tabswitches must make proper on contact and the Upper Manual D.C. keyswitches must make proper off contact.

TRANSISTOR BASING DIAGRAM

FIG. A

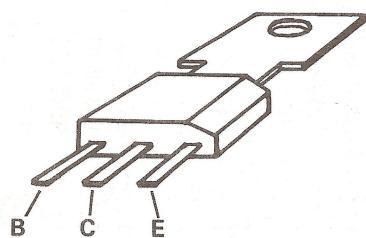


FIG. B

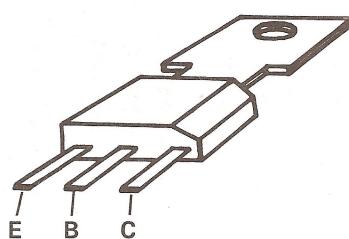


FIG. D

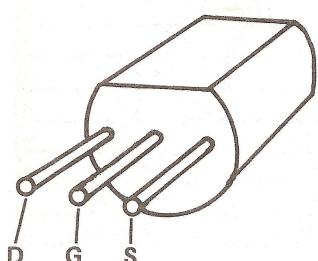


FIG. C

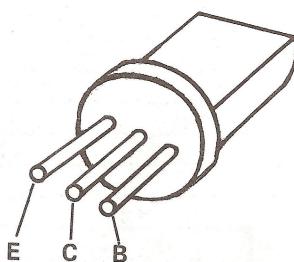


FIG. E

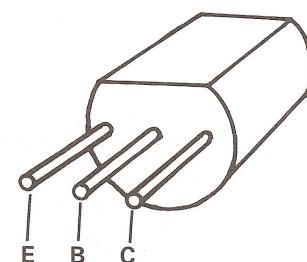


FIG. F

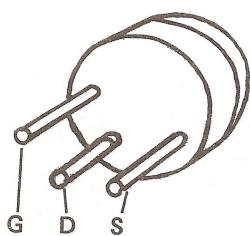
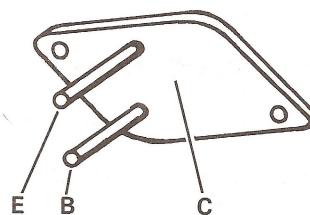


FIG. G



PART NUMBER	FIGURE						
992-001192	G	991-012328	F	991-016727	C		
991-002232	C	991-012396	F	991-016788	C		
991-002271	G	991-012686	F	992-017169	G		
991-002298	C	992-013170	A	991-017456	F		
991-002356	C	991-013543	C	991-018238	C		
991-002873	C	991-013544	C	991-018237	B		
991-002888	C	991-013599	C				
992-003139	G	991-015000	A				
991-003304	C	991-015001	A				
991-008393	C	991-015062	A				
991-008394	C	991-015063	A				
992-008890	G	991-015316	C				
991-010098	C	991-015587	C				
991-010462	C	991-015614	C				
991-011576	D	991-015663	C				
991-011706	D	991-016274	C				

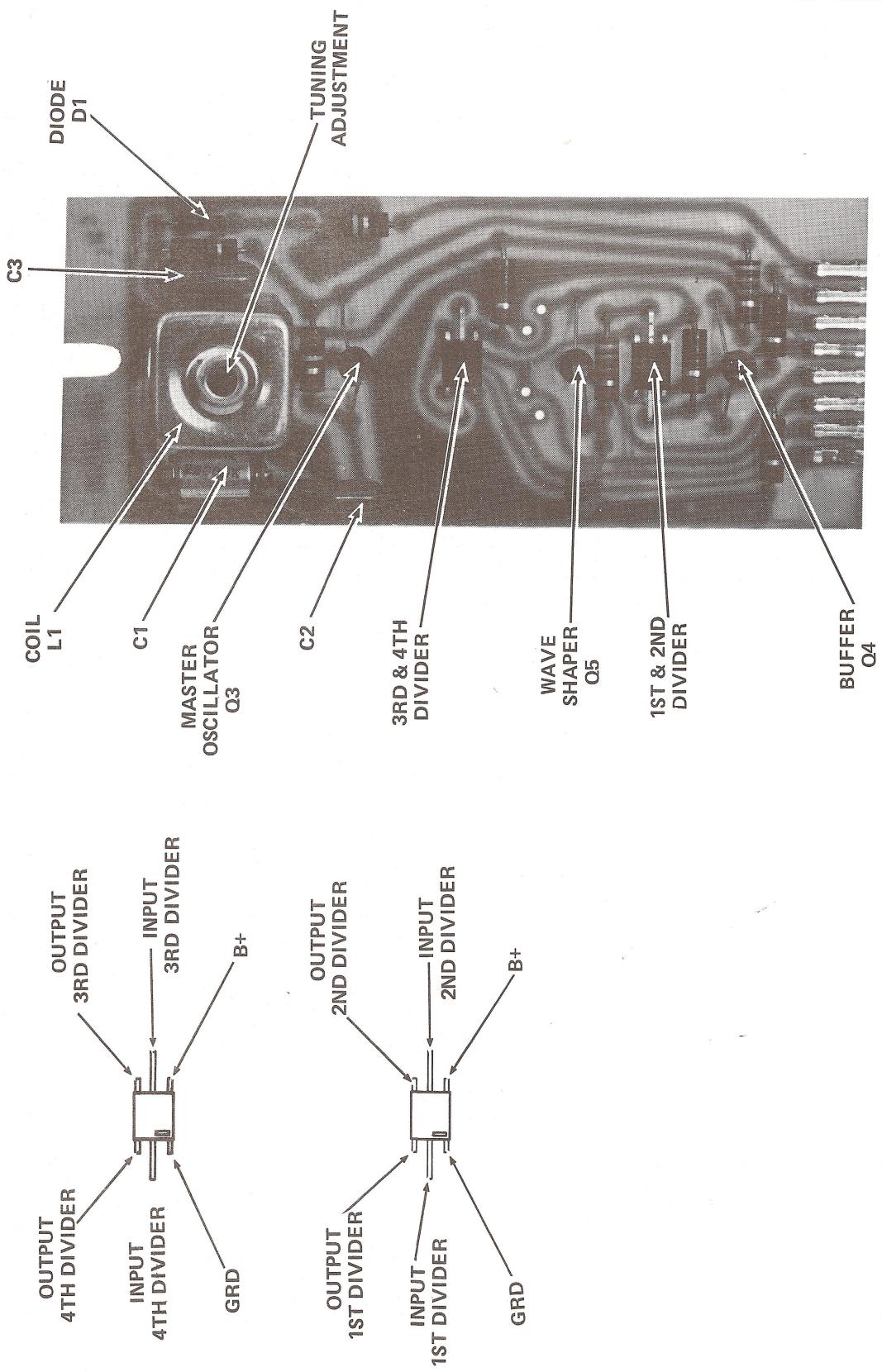
TRANSISTOR LOCATION CHART

Q NOS.	NAME OF BOARD	Q NOS.	NAME OF BOARD	Q NOS.	NAME OF BOARD
1	Vibrato Board	59	Flute Q.C. Board	118	Brass Keying Board
2	Vibrato Board	60	Flute Q.C. Board	119	Brass Voicing Board
3	Tone Generator Board	61	Flute Q.C. Board	120	Brass Voicing Board
4	Tone Generator Board	62	Reed/Diapason Q.C. Board	121	Brass Voicing Board
5	Tone Generator Board	63	Reed/Diapason Q.C. Board	122	Brass Voicing Board
13	Repeat Chassis	64	Reverb Board	123	Brass Voicing Board
14	Repeat Chassis	65	Reverb Board	124	Brass Voicing Board
15	Repeat Chassis	66	Reverb Board	125	Brass Voicing Board
16	Repeat Chassis	67	Reverb Board	126	Brass Voicing Board
17	Repeat Chassis	68	Reverb Board	127	Brass Voicing Board
18	Repeat Chassis	71	Flute Q.C. Board	128	Brass Voicing Board
19	Repeat Chassis	72	Multi-Channel Chorus Board	129	Brass Voicing Board
20	Repeat Chassis	73	Multi-Channel Chorus Board	130	Brass Voicing Board
21	Reed/Diapason Q.C. Board	74	Multi-Channel Chorus Board	131	Brass Voicing Board
22	Reed/Diapason Q.C. Board	75	Multi-Channel Chorus Board	132	Brass Voicing Board
23	Reed/Diapason Q.C. Board	76	Multi-Channel Chorus Board	133	Brass Voicing Board
24	Bass Pedal Board	77	Multi-Channel Chorus Board	134	Brass Voicing Board
25	Bass Pedal Board	78	Multi-Channel Chorus Board	135	Brass Voicing Board
26	Bass Pedal Board	79	Multi-Channel Chorus Board	136	Brass Voicing Board
27	Bass Pedal Board	80	Multi-Channel Chorus Board	137	Brass Voicing Board
28	Bass Pedal Board	81	Multi-Channel Chorus Board	138	Brass Voicing Board
29	Bass Pedal Board	82	Multi-Channel Chorus Board	139	Wow Wow Board
30	Bass Pedal Board	83	Multi-Channel Chorus Board	140	Wow Wow Board
31	Bass Pedal Board	84	Multi-Channel Chorus Board	141	Wow Wow Board
32	Bass Pedal Board	85	Multi-Channel Chorus Board	142	Wow Wow Board
33	Bass Pedal Board	89	Leslie Amplifier Board	143	Wow Wow Board
34	Reed/Diapason Q.C. Board	90	Leslie Amplifier Board	144	Wow Wow Board
35	Flute Q.C. Board	91	Leslie Amplifier Board	145	Brass Keying Board
36	Flute Q.C. Board	92	Leslie Amplifier Board	146	Brass Voicing Board
37	Flute Q.C. Board	93	Leslie Amplifier Board	147	Brass Voicing Board
38	Flute Q.C. Board	94	Leslie Amplifier Board	148	Brass Voicing Board
39	Flute Q.C. Board	95	Power Supply Chassis	149	Brass Voicing Board
40	Flute Q.C. Board	96	Power Supply Chassis	150	Brass Voicing Board
41	Flute Q.C. Board	97	Main Amplifier Chassis	151	Brass Voicing Board
42	Flute Q.C. Board	98	Main Amplifier Chassis	152	Brass Voicing Board
43	Flute Q.C. Board	99	Main Amplifier Chassis	153	Brass Voicing Board
44	Reed/Diapason Q.C. Board	100	Main Amplifier Chassis	154	Brass Voicing Board
45	Reed/Diapason Q.C. Board	101	Main Amplifier Chassis	155	Brass Voicing Board
46	Reed/Diapason Q.C. Board	102	Main Amplifier Chassis	156	Brass Voicing Board
47	Reed/Diapason Q.C. Board	103	Power Supply Chassis	157	Brass Voicing Board
48	Reed/Diapason Q.C. Board	104	Power Supply Chassis	158	Wow Wow Board
49	Reed/Diapason Q.C. Board	105	Golden Harp Board	159	Wow Wow Board
50	Flute Q.C. Board	106	Golden Harp Board	160	Bass Pedal Voicing Board
51	Reed/Diapason Q.C. Board	107	Golden Harp Board	161	Bass Pedal Voicing Board
52	Flute Q.C. Board	108	Golden Harp Board	162	Bass Pedal Voicing Board
53	Flute Q.C. Board	109	Golden Harp Board	163	Bass Pedal Voicing Board
54	Flute Q.C. Board	110	Golden Harp Board	164	Bass Pedal Voicing Board
55	Percussion Board	114	Tone Generator Output Brd.	165	Bass Pedal Voicing Board
56	Percussion Board	115	Brass Keying Board	166	Bass Pedal Voicing Board
57	Percussion Board	116	Brass Keying Board	167	Bass Pedal Voicing Board
58	Percussion Board	117	Brass Keying Board	168	Bass Pedal Voicing Board

PHOTOGRAPHS

TONE GENERATOR BOARD

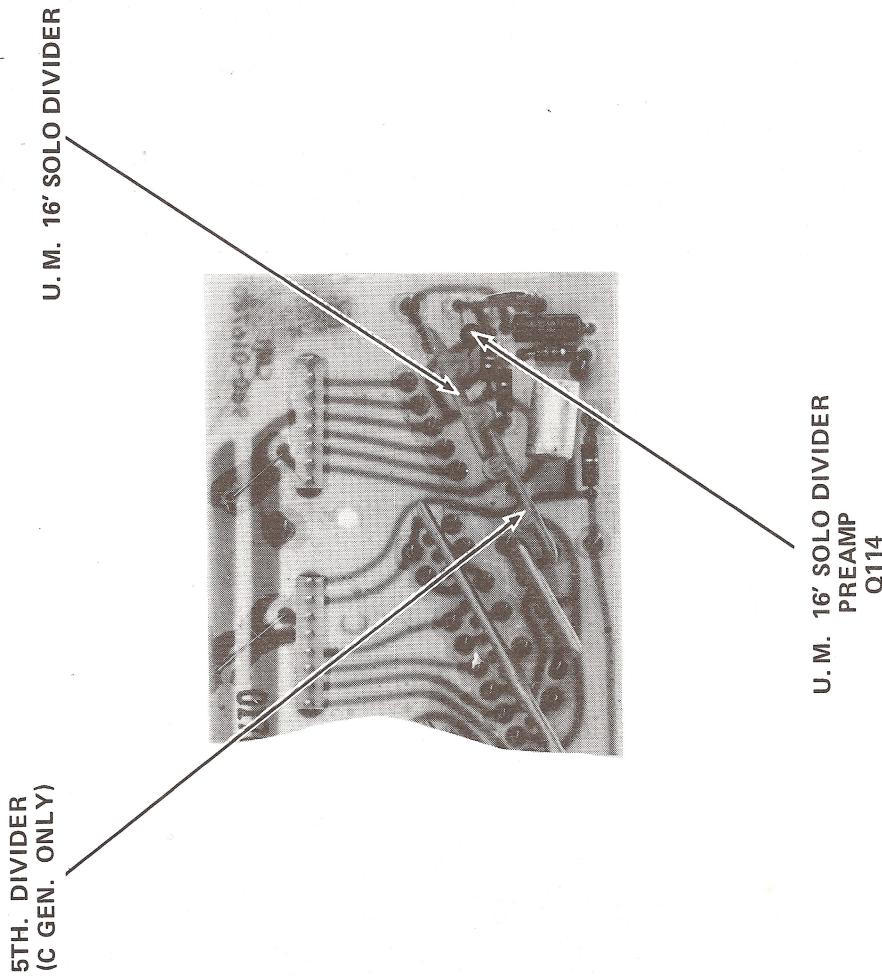
(1 of 12 Located on Upper Manual Keyswitch Assembly).



PHOTOGRAPHS

TONE GENERATOR OUTPUT BOARD

(Part of Tone Generator Assembly)

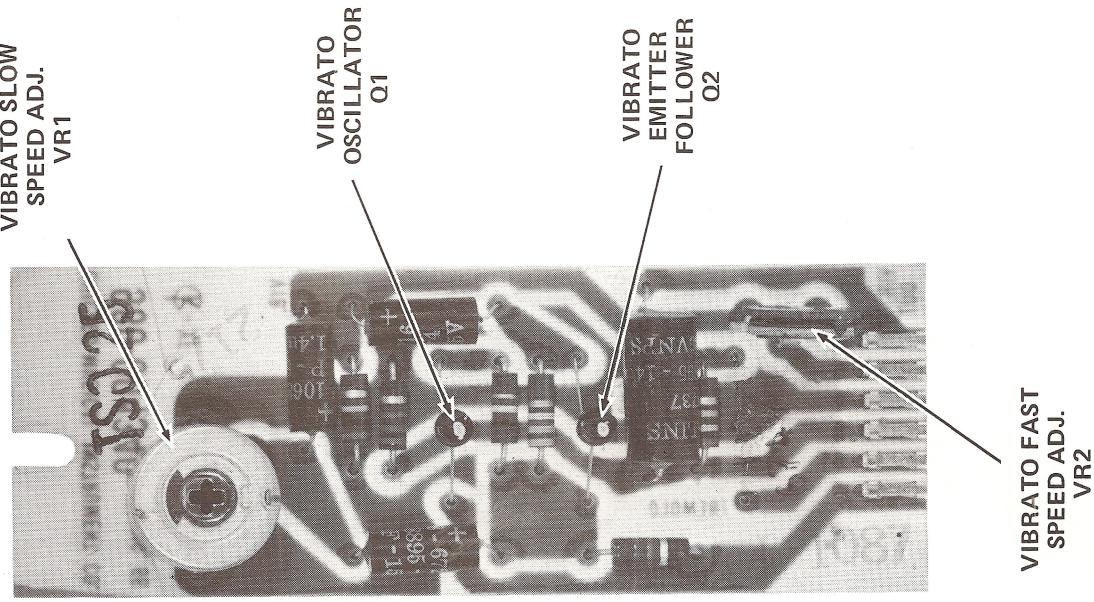
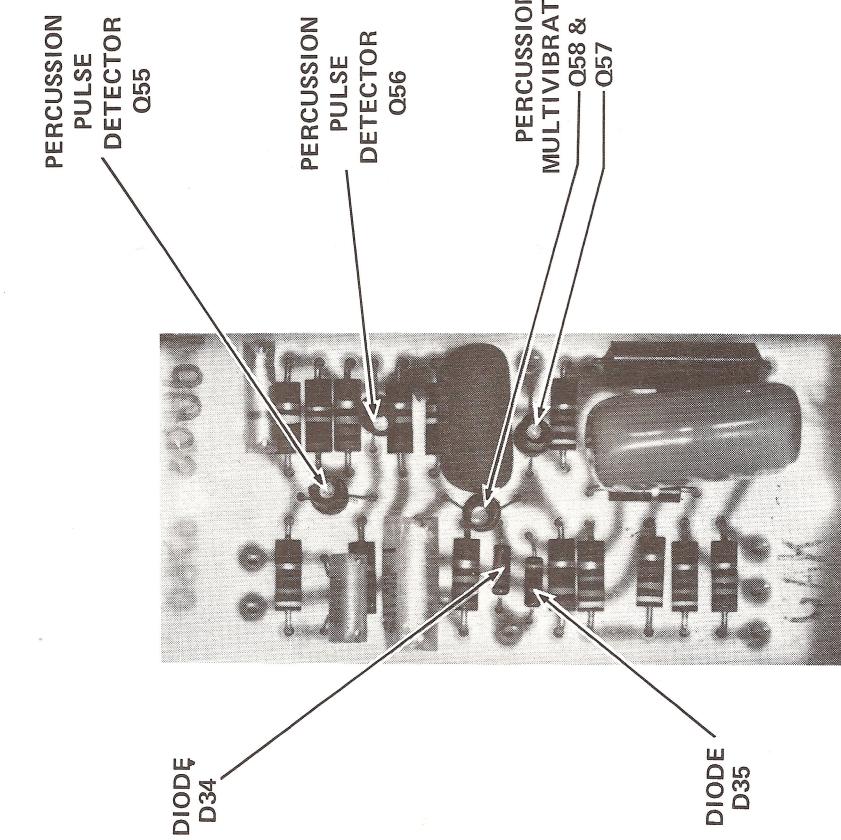


PERCUSSION BOARD

(Located on Left Side Panel as Viewed from Rear of Organ)

VIBRATO BOARD

(Located on Tone Generator Assembly)

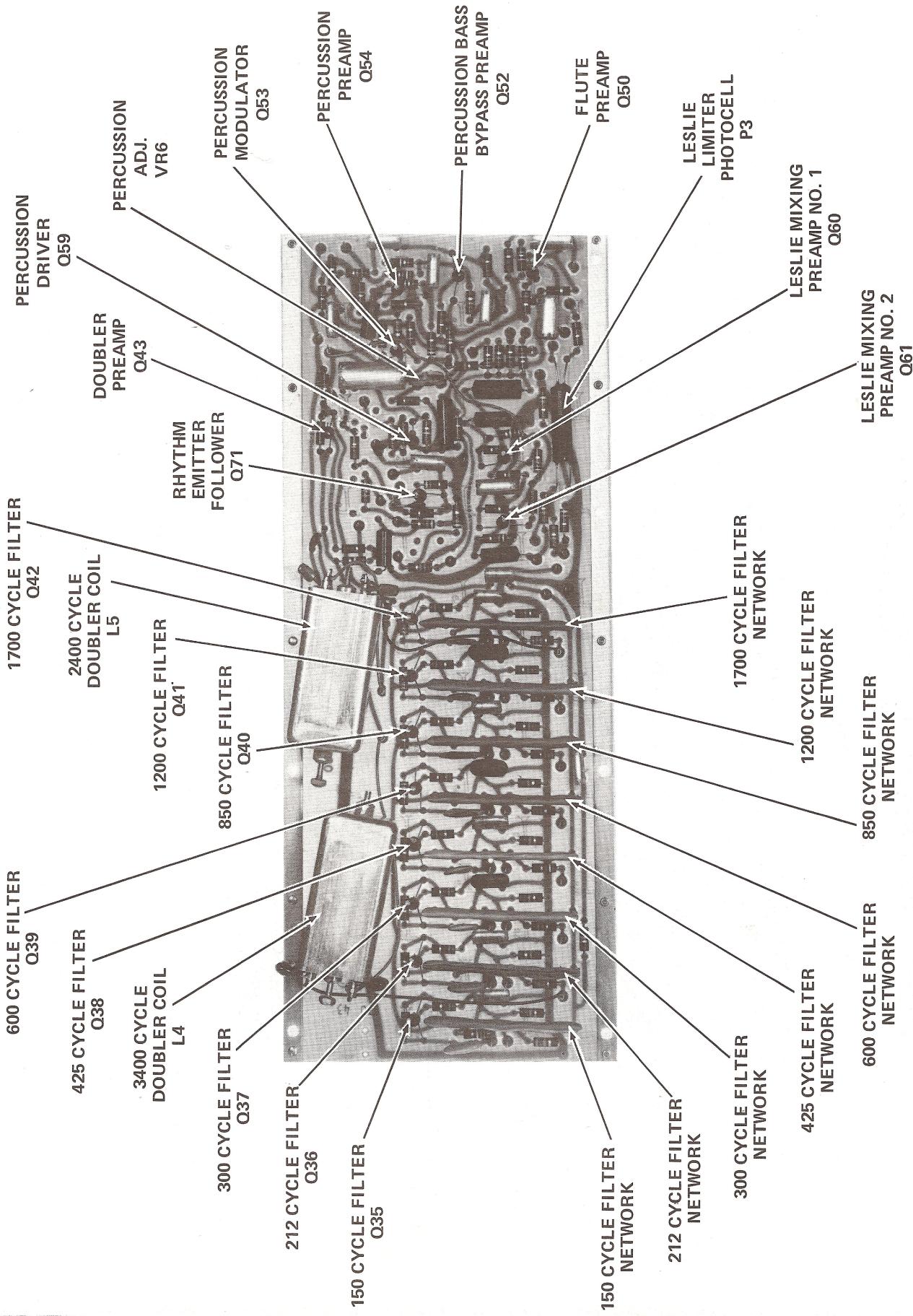


PHOTOGRAPHS

FLUTE QUALITY CONTROL BOARD

(Located Under Top of Organ)

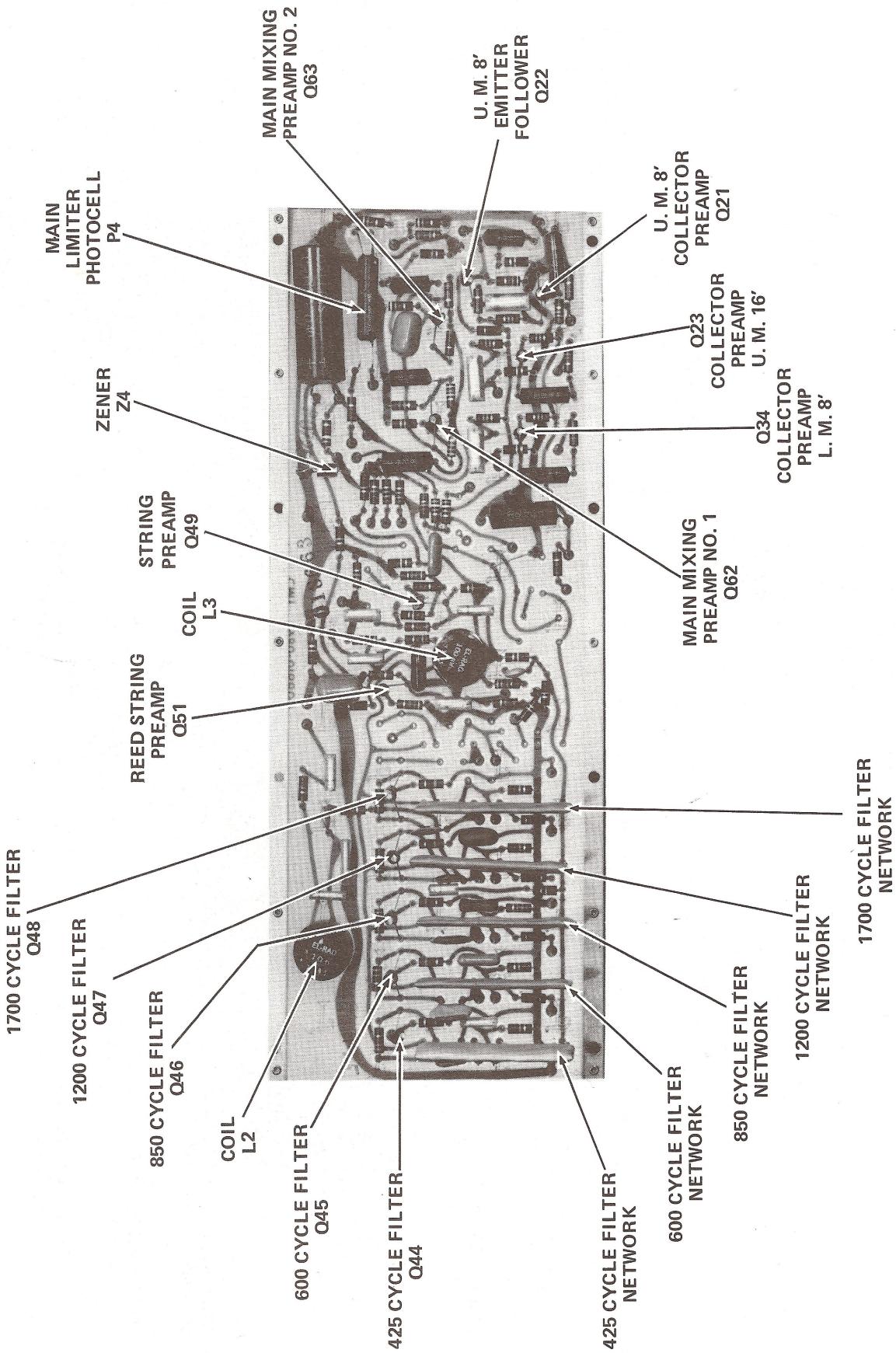
PHOTOGRAPHS



REED/DIAPASON QUALITY CONTROL BOARD

(Located Under Top of Organ)

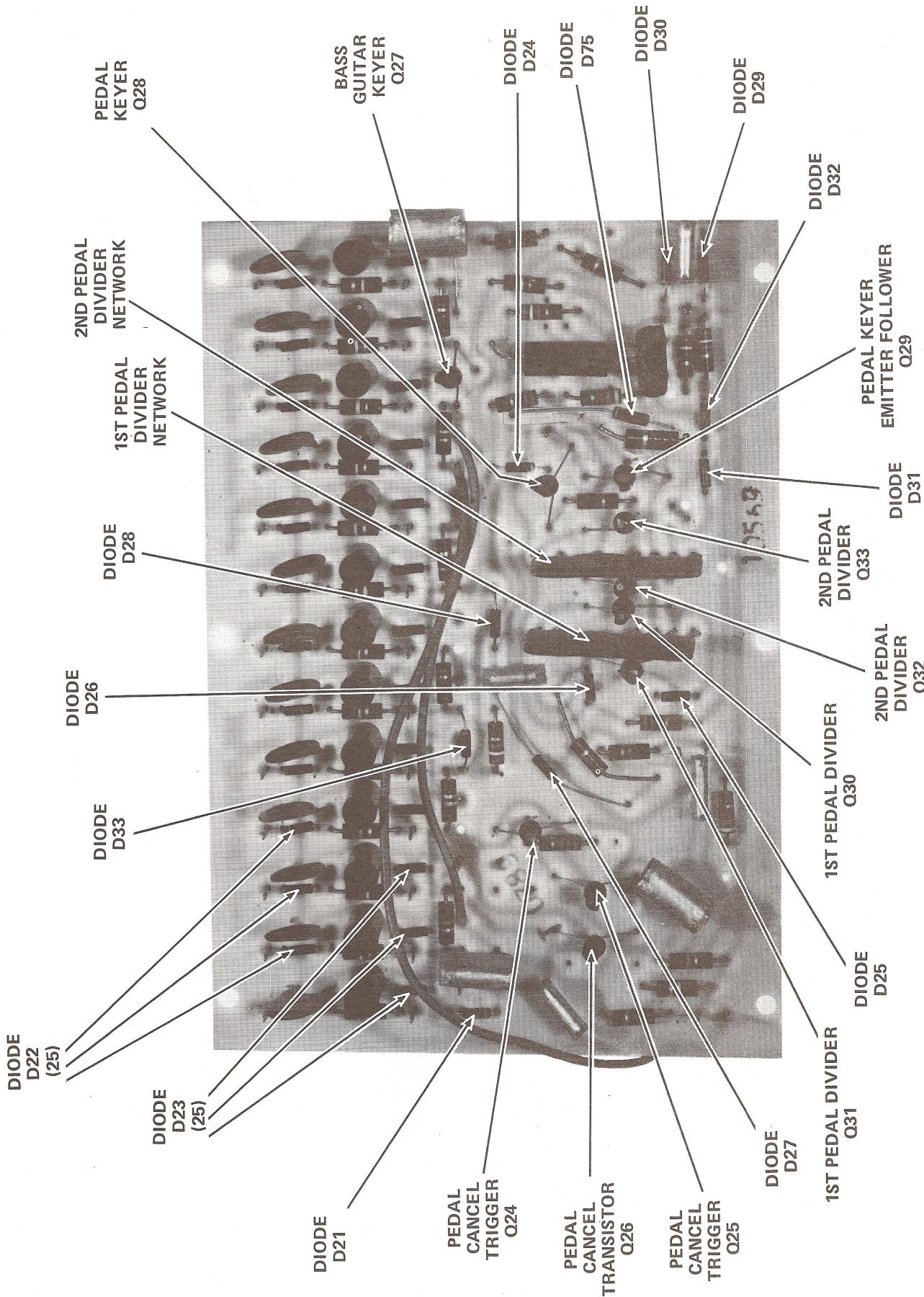
PHOTOGRAPHS



PHOTOGRAPHS

BASS PEDAL BOARD

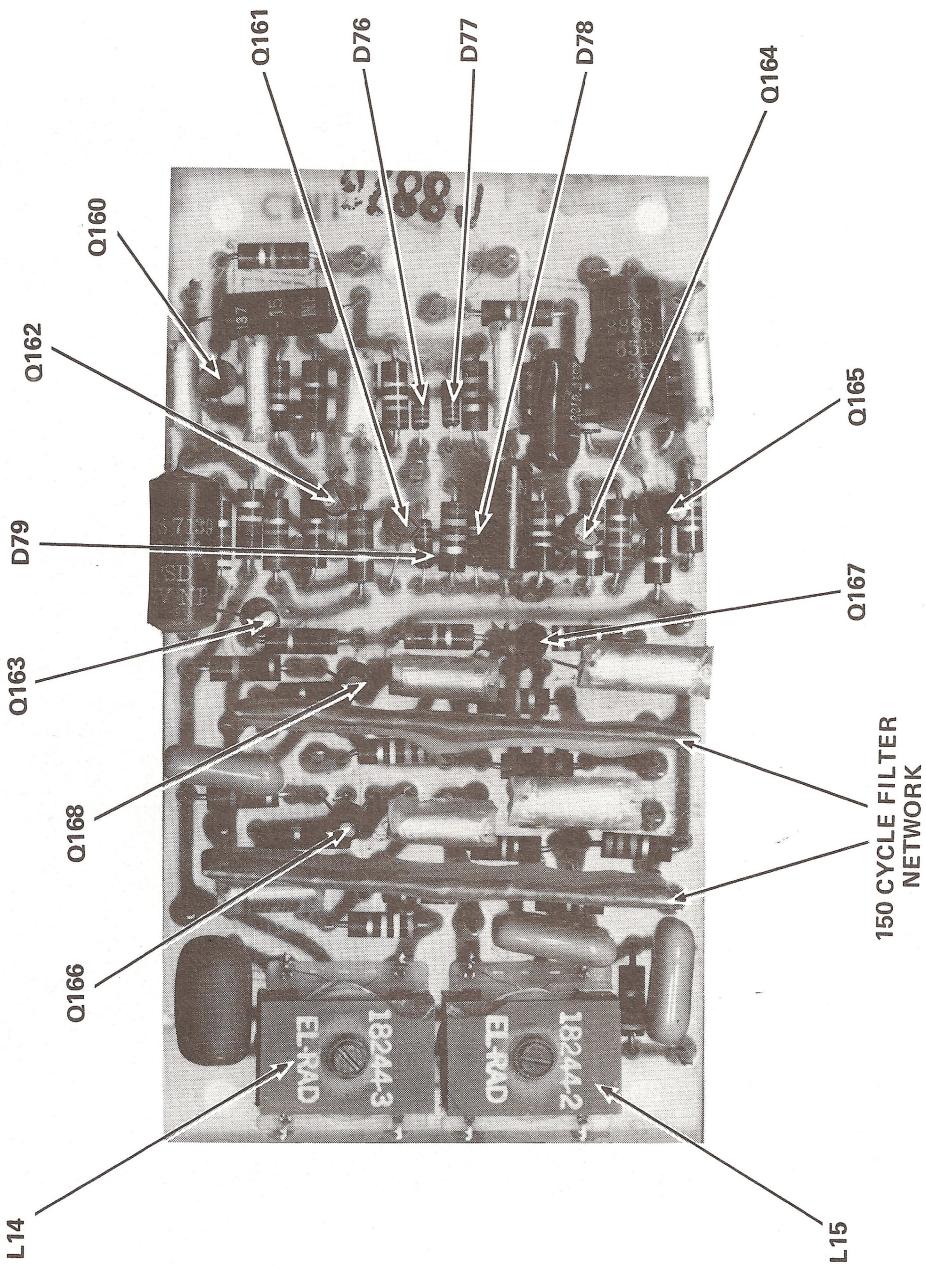
(Located on Right Side of Tone Generator Assembly as Viewed from Rear of Organ)



BASS PEDAL VOICING BOARD

(Located Under Top of Organ)

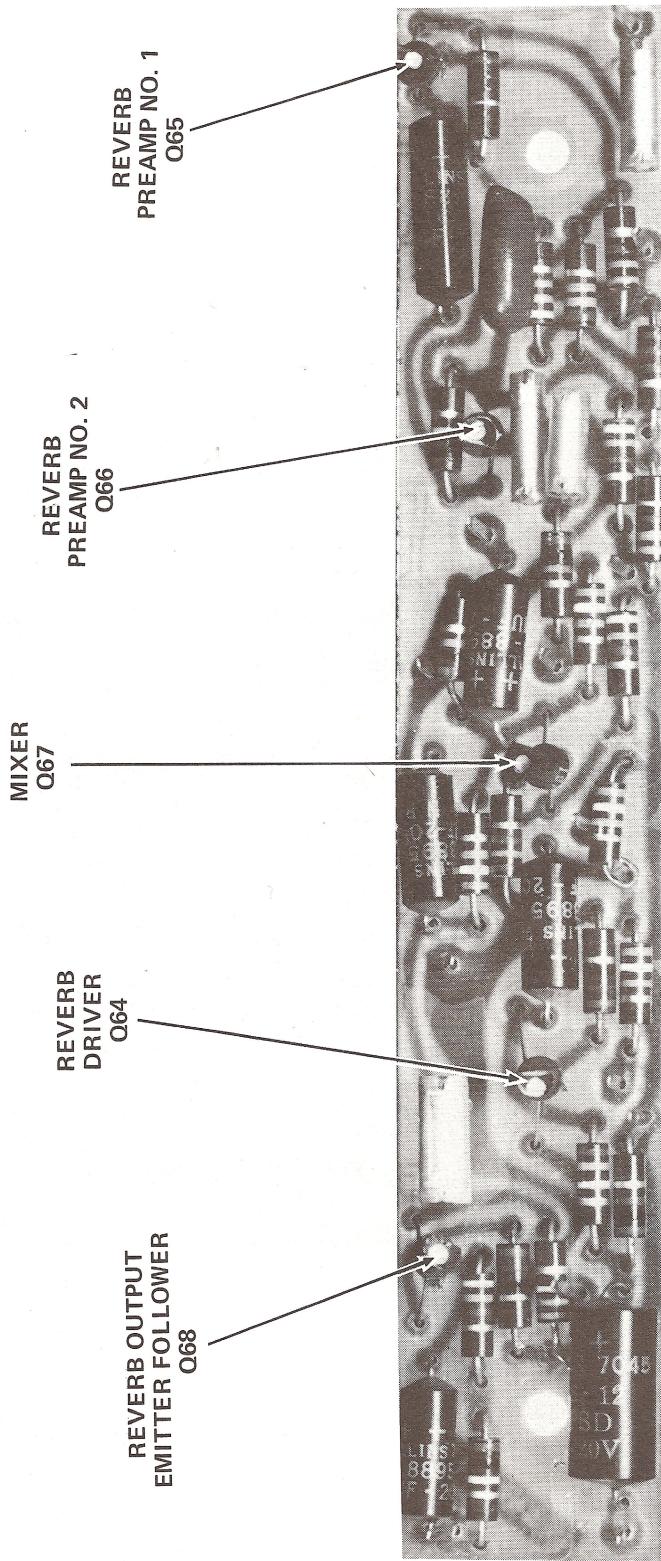
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REVERB BOARD

(Located on Reverb Spring Unit)

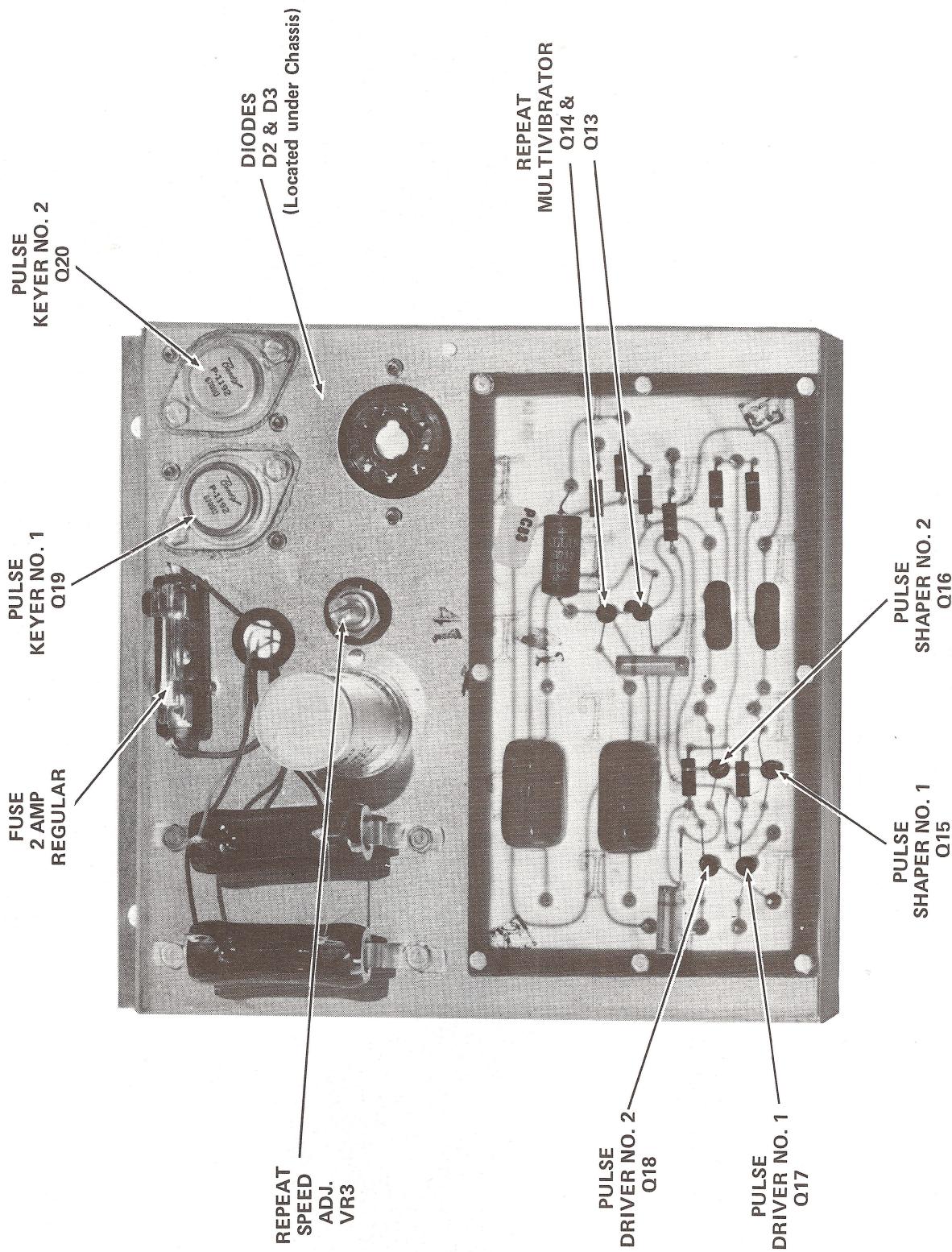
PHOTOGRAPHS



PHOTOGRAPHS

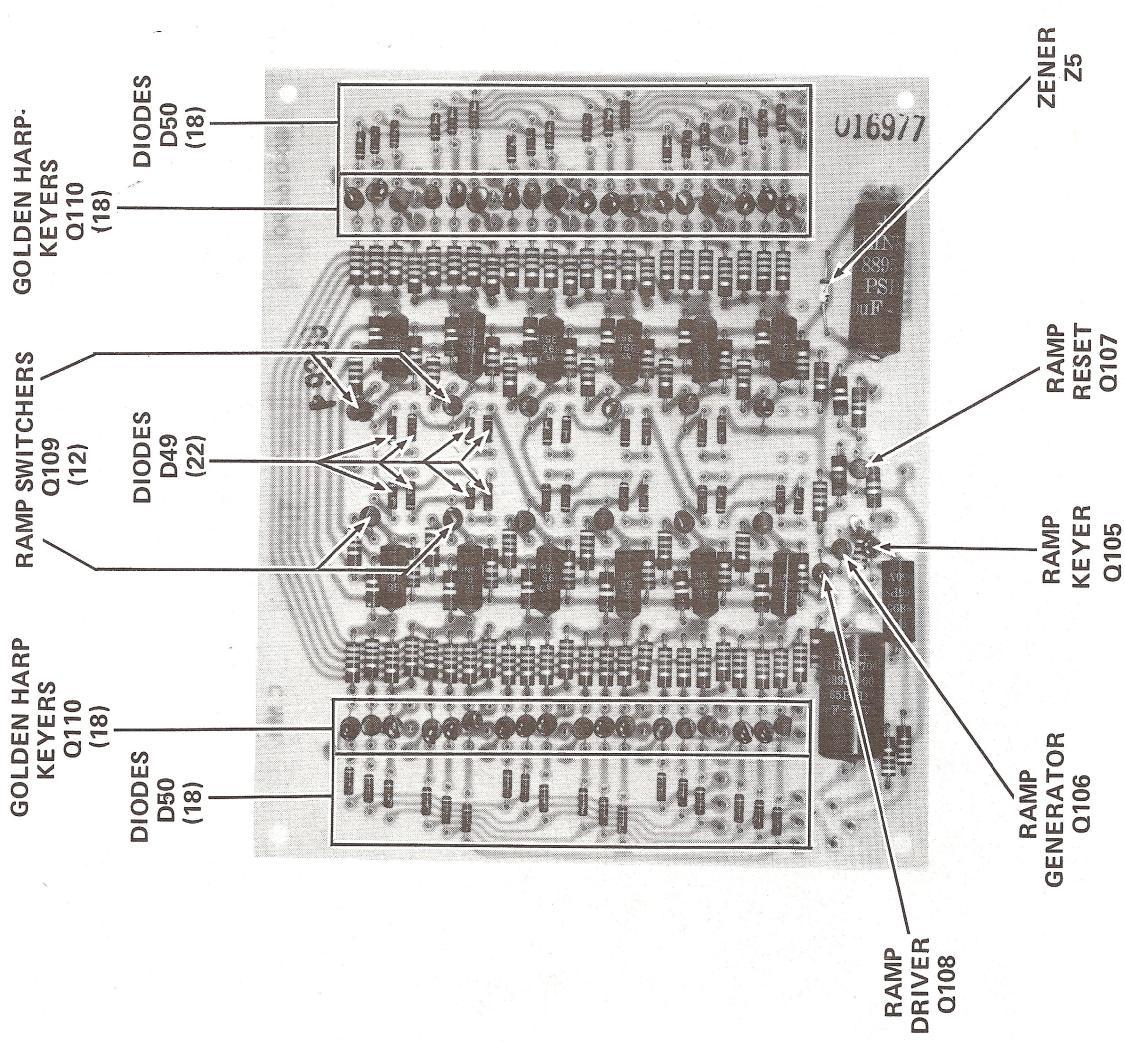
REPEAT CHASSIS

(Located On Left Side of Expression Pedal Housing as Viewed From Rear of Organ)



GOLDEN HARP BOARD

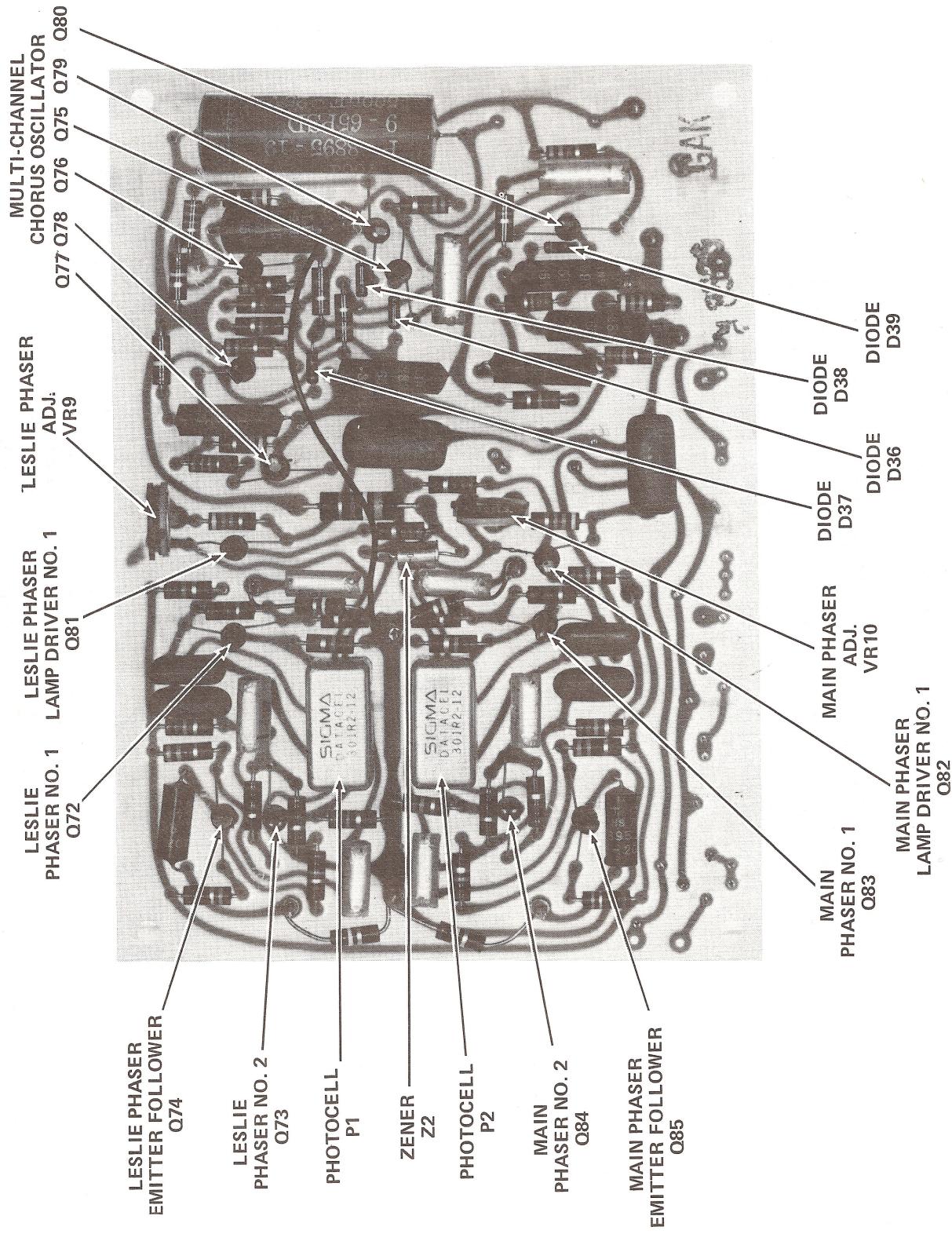
(Located Under Right Side of Tab Rail Assembly as Viewed from Rear of Organ)



MULTI-CHANNEL CHORUS BOARD

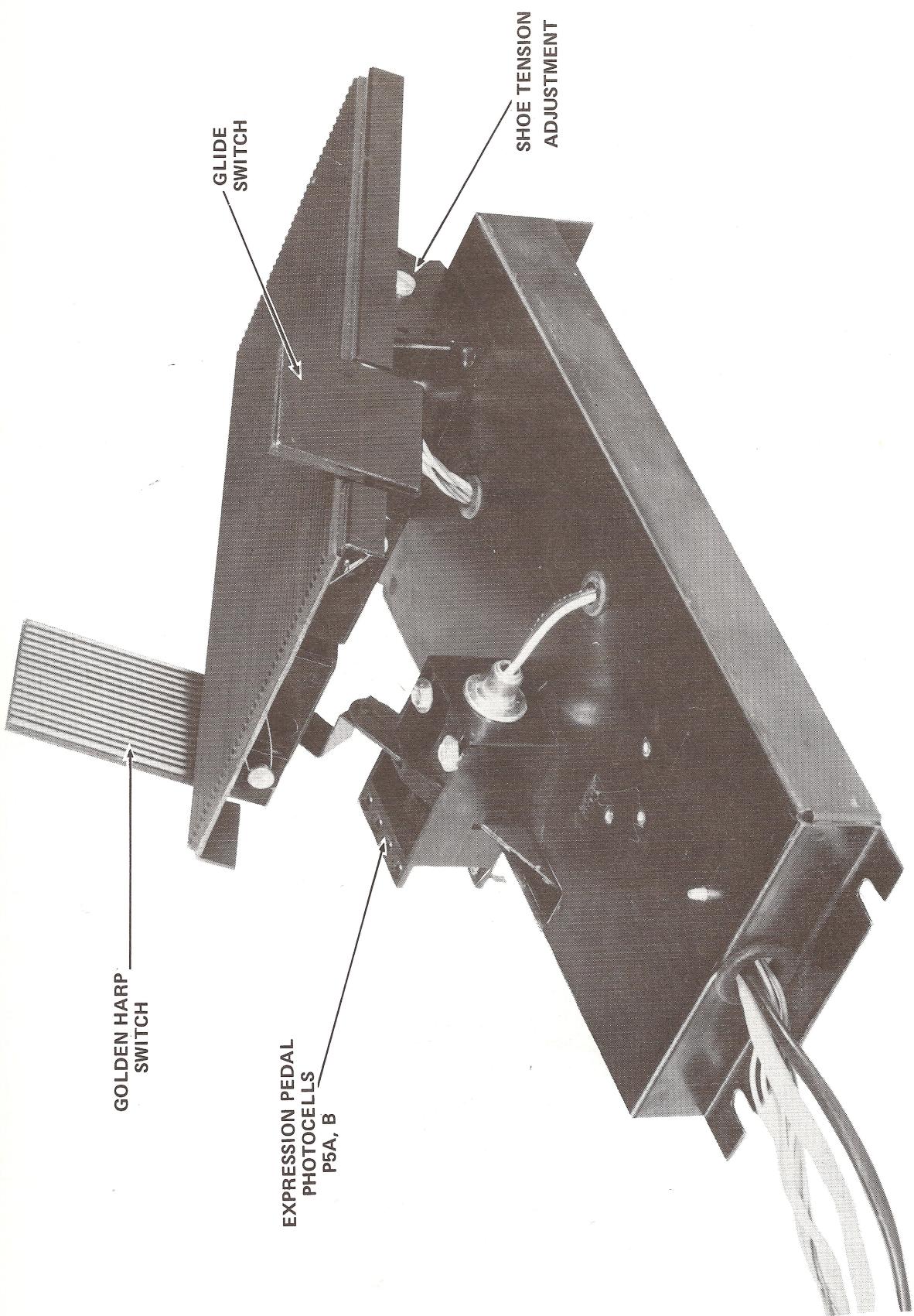
(Located on Right Side of Tone Generator Assembly as Viewed from Rear of Organ)

PHOTOGRAPHS



GOLDEN HARP / GLIDE / EXPRESSION PEDAL ASSEMBLY

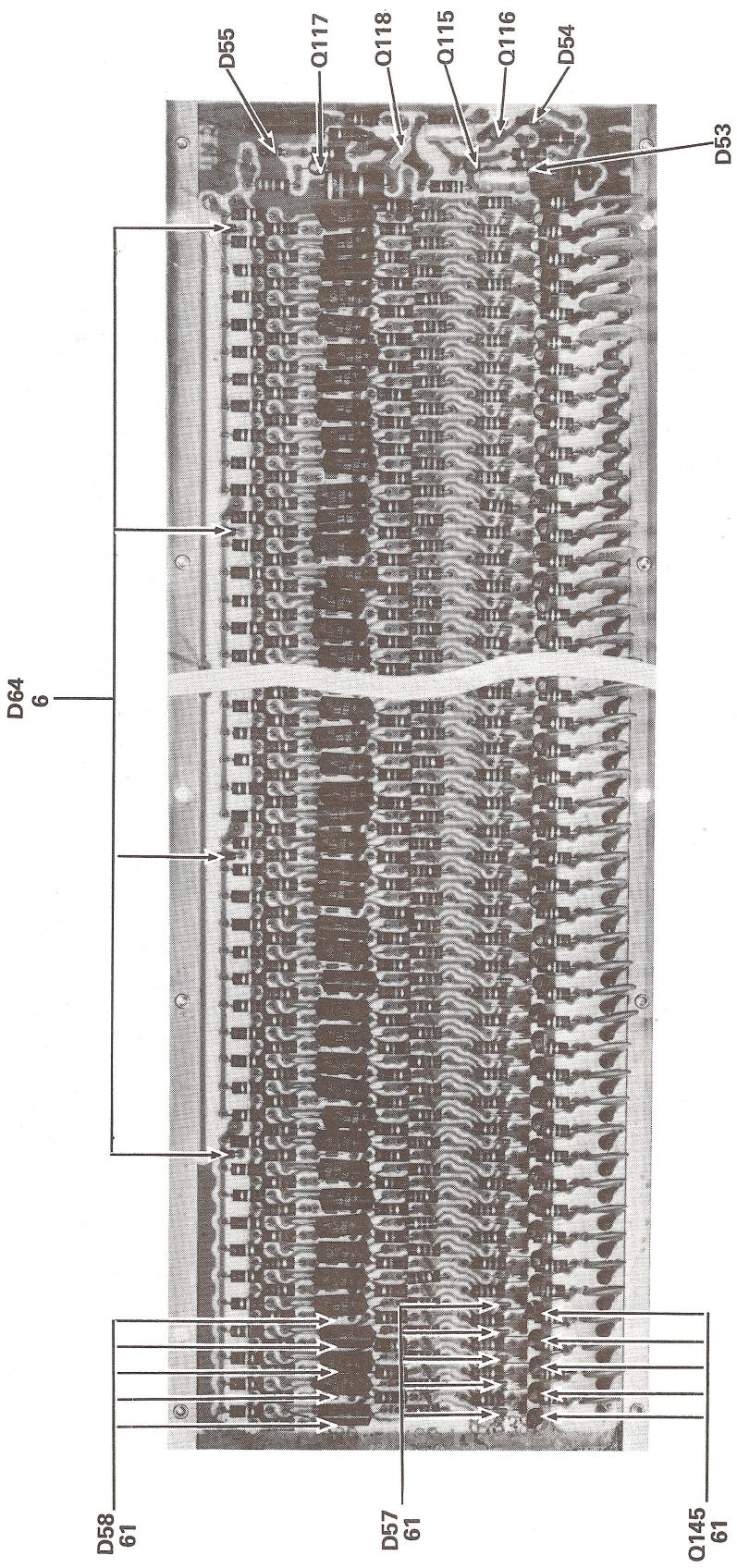
PHOTOGRAPHS



BRASS KEYING BOARD

(Located on Back of Leslie Unit)

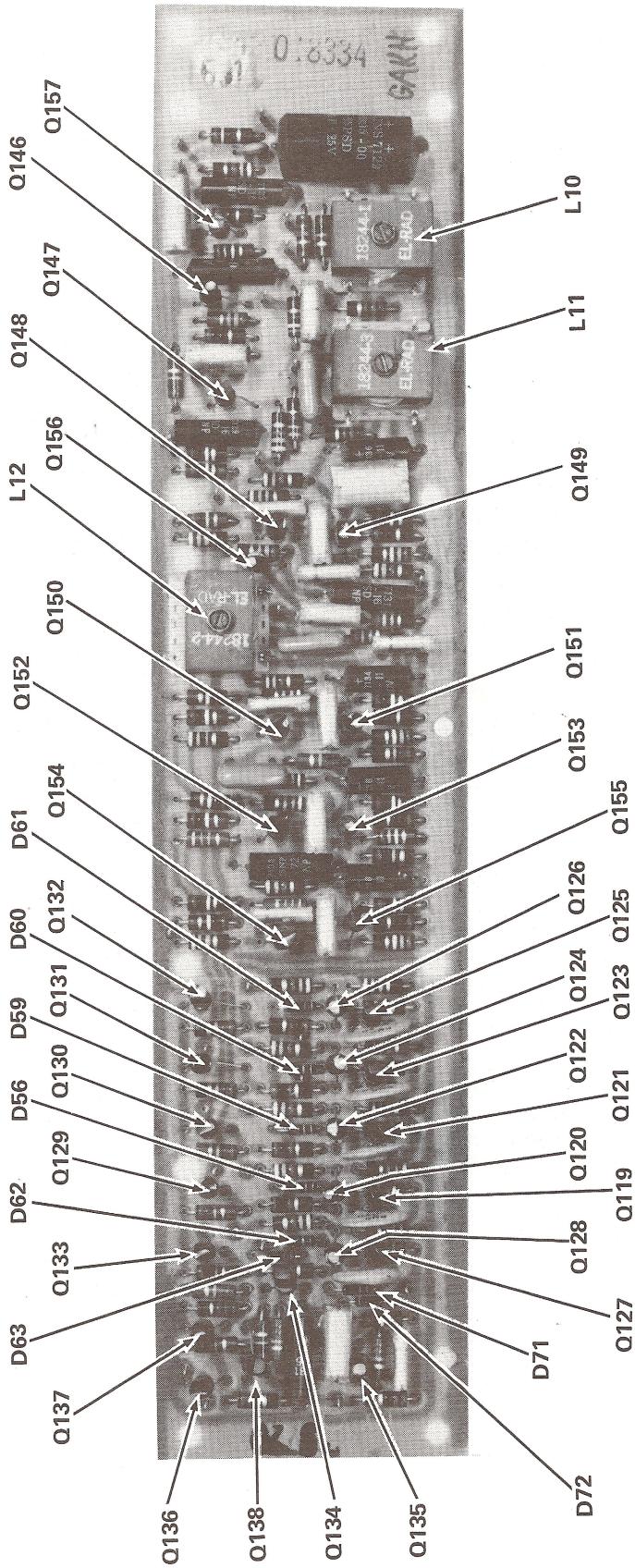
PHOTOGRAPHS



BRASS VOICING BOARD

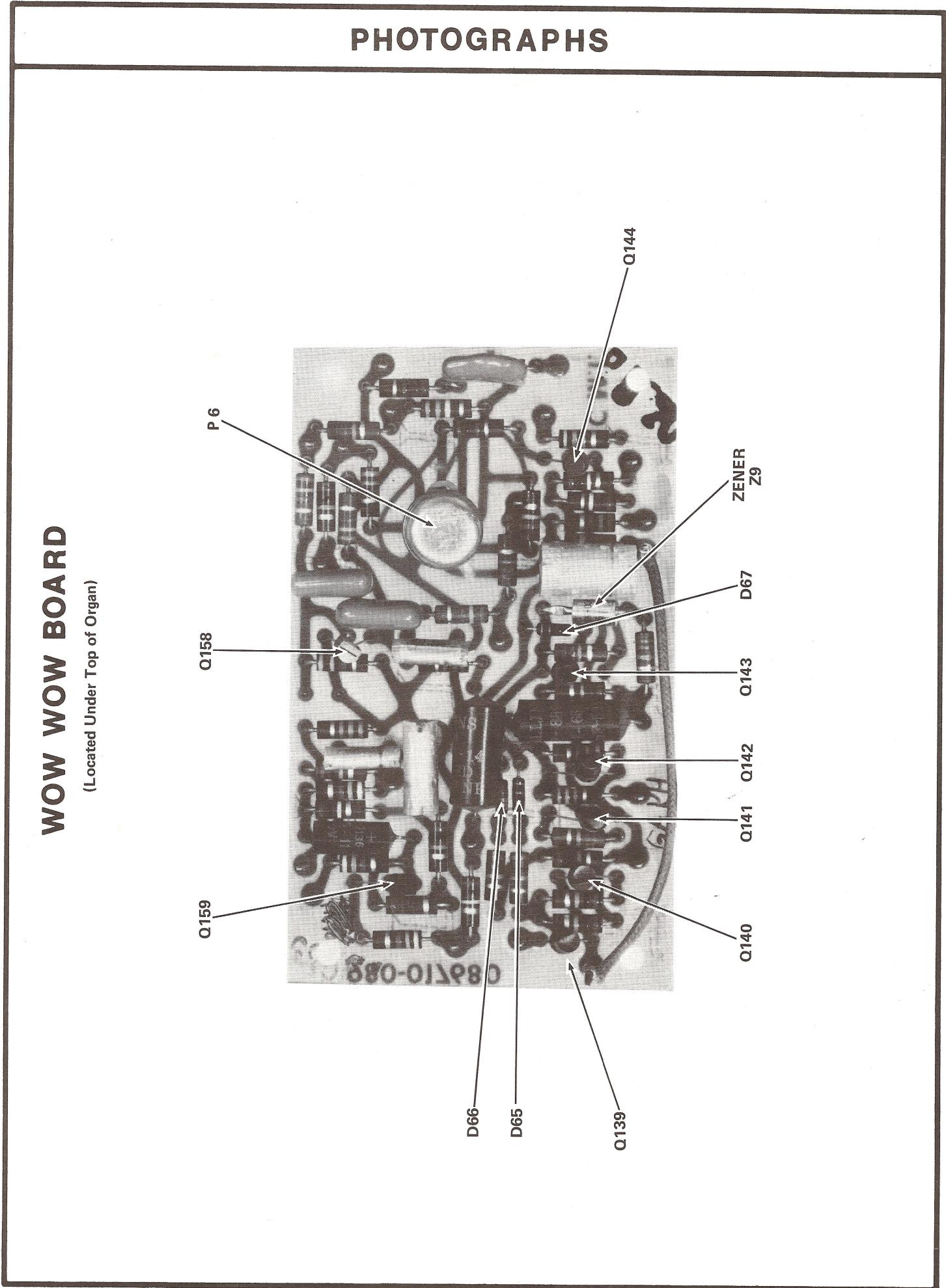
(Located Under Top of Organ)

PHOTOGRAPHS



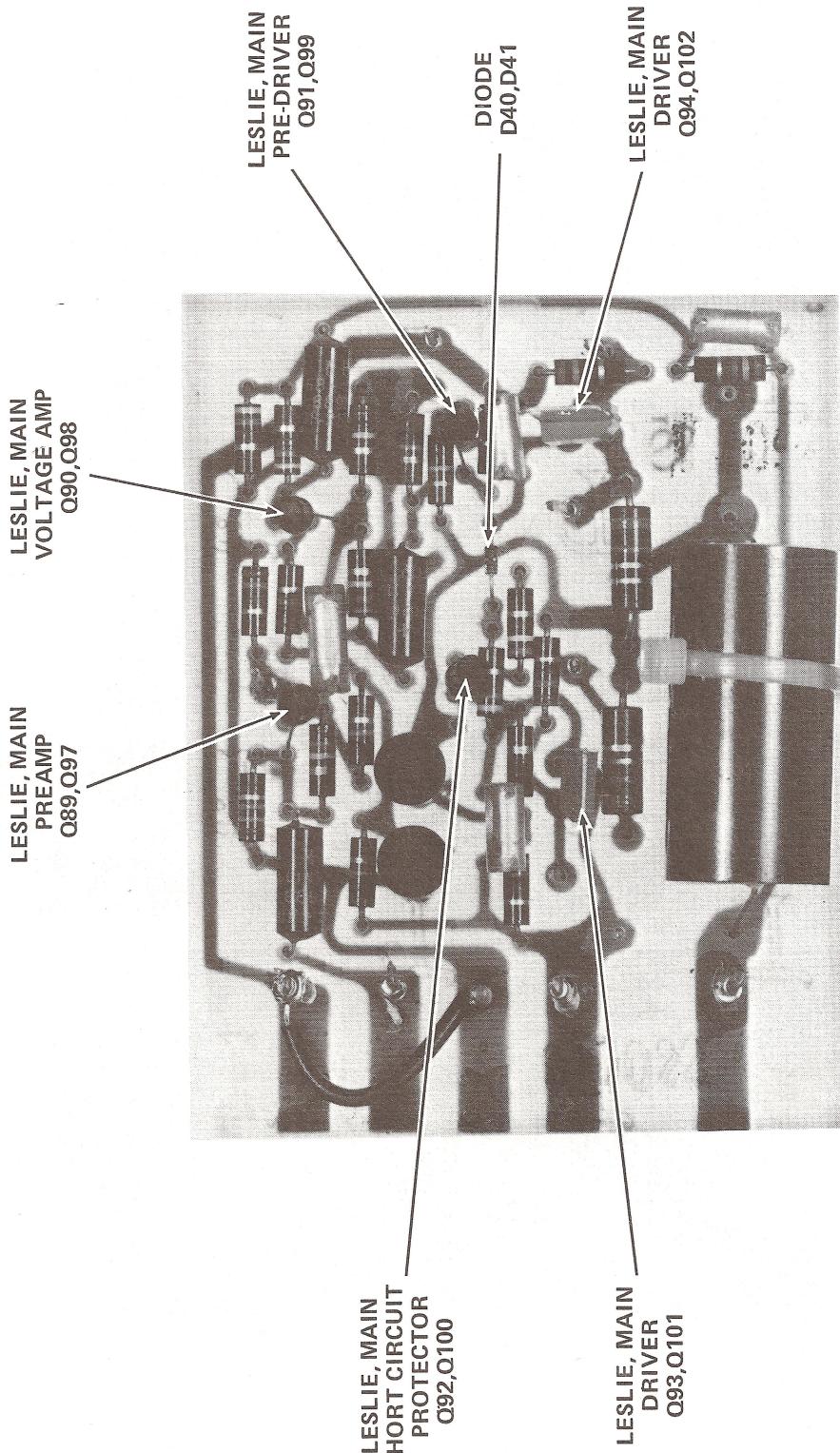
WOW BOARD

(Located Under Top of Organ)



AMPLIFIER BOARD
LESLIE OR MAIN
(Located in Power Supply Chassis)

PHOTOGRAPHS

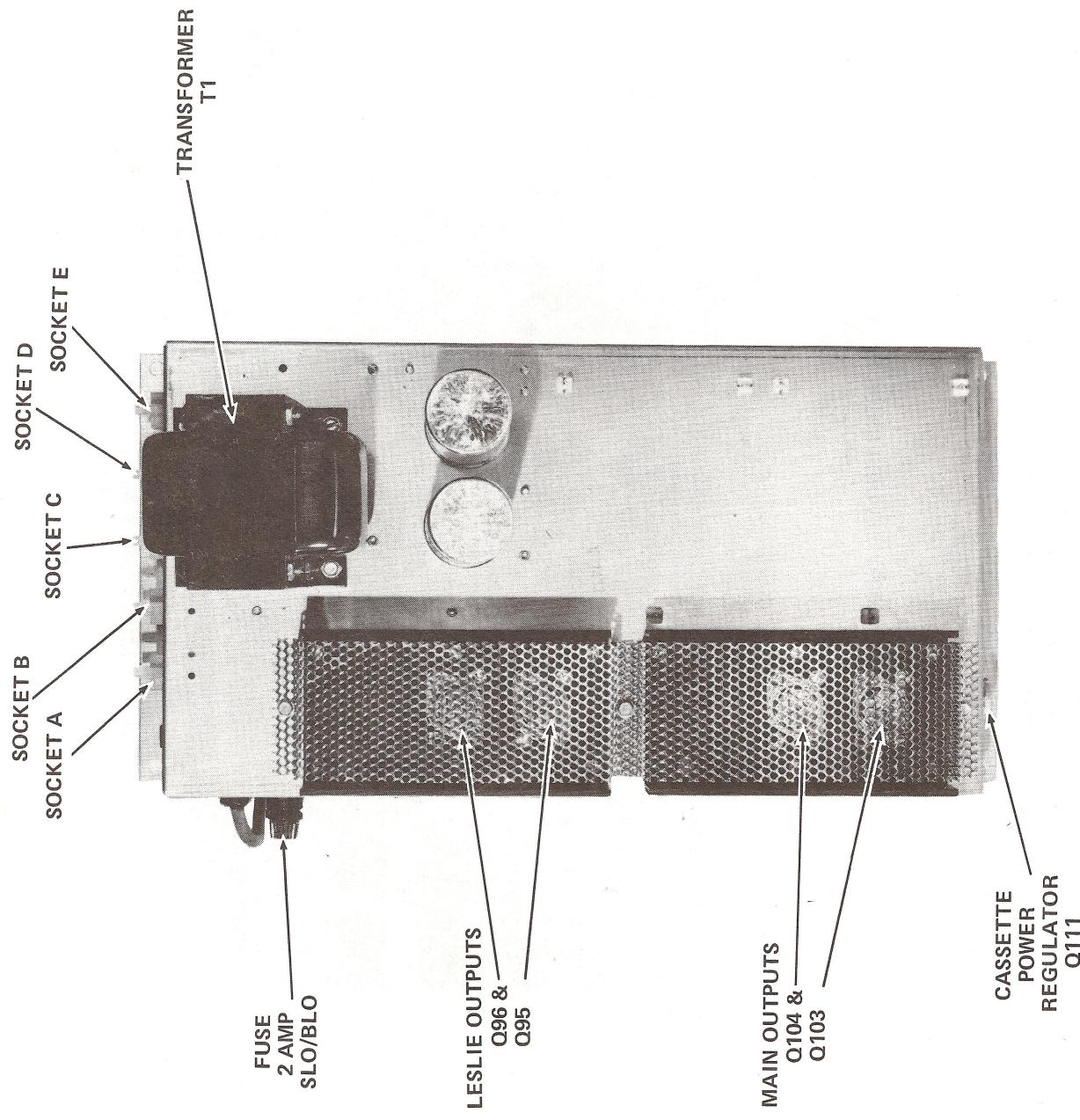


PHOTOGRAPHS

AMPLIFIER/POWER SUPPLY CHASSIS

Top View

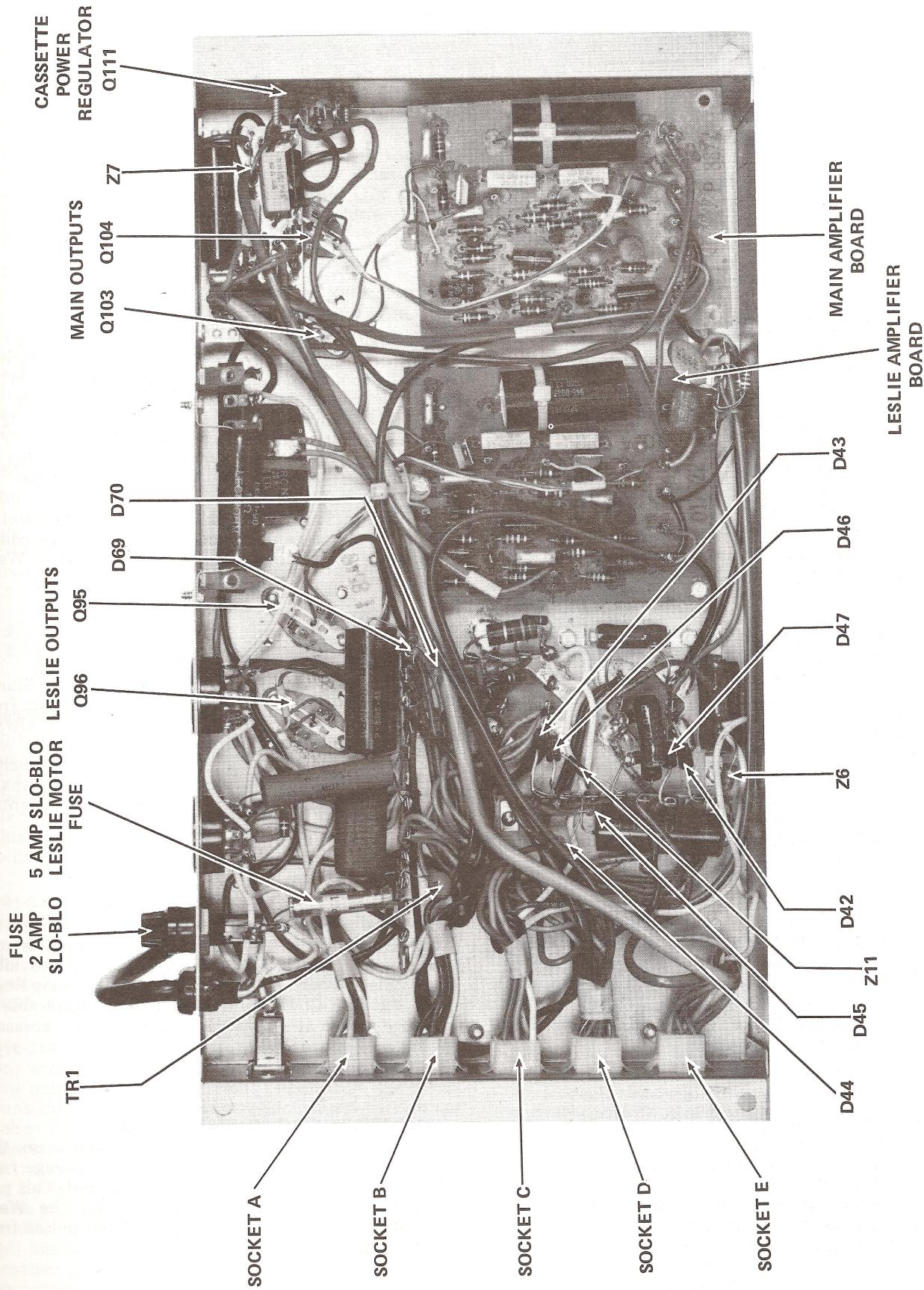
(Located on Left Side Panel as Viewed from Rear of Organ)



PHOTOGRAPHS

AMPLIFIER/POWER SUPPLY CHASSIS

Bottom View



CIRCUIT DESCRIPTION

PLAY ALONG

AUTOMATIC RHYTHM

(Refer to Drawings K1, K2, K4, & K5)

It is the function of the Clock to produce a series of voltage pulses in a specific rhythmical pattern. These pulses are then combined in several different ways within the Matrix. The combined pulses from the Matrix are connected to the Rhythm Selector Switches where they are then routed to the desired Instrumentation circuits. When the Instrumentation circuits receive the Clock pulses, they produce the rhythm voices which are then amplified by the Audio Output Preamp Q149 and sent to the organ preamp.

Shift Register Driver Q66 reaching the base of the currently off transistor. Waltz and Swing Waltz rhythms alter the counting sequence of Shift Register #1. When Waltz or Swing Waltz rhythm push-buttons are depressed, a positive pulse from Logic Gate 5B (Q96 & Q97) is fed back through the feedback switch to Q82. This advances the off state from Q82 to Q81, thus causing the Shift Register to essentially skip one count. Since the pulse from Logic Gate 5B appears only on every other cycle of Shift Register #1, the result is a 5 pulse count on one cycle and a 4 pulse count on the other. This counting sequence is required only for the $\frac{3}{4}$ time Waltz rhythms.

Q69-71 CLOCK MULTIVIBRATOR & STARTER

This circuit is the source of all the rhythm timing pulses. It operates continuously at the speed set by the tempo control and the triplet timing Regulator #1 Q67.

The Clock Multi starts running when the Multi Starter transistor is turned on (conducting) by a positive voltage supplied to its base from the start switch. Negative output pulses from Clock Multi transistor Q69 are sent to the Shift Register Driver Q66. Also, negative output pulses from Clock Multi transistor Q70 are sent to the Shift Register Program Divider Q72-73.

Q83 SHIFT REGISTER STARTER

When the start switch is off the Shift Register Starter transistor is off, thus removing the emitter of Q82 from ground. This assures that Shift Register #1 always begins counting from the beginning, specifically with Q82 in its off state. While the Rhythm Start Switch is depressed, the Shift Register Starter transistor remains on, allowing Shift Register #1 to continue its counting cycles.

Q66 SHIFT REGISTER DRIVER

This transistor is a pulse amplifier and inverter which receives negative input pulses from Clock Multi transistor Q69. The positive output pulses are sent to Shift Register #1 Q78-82 unless diverted and neutralized by a Shunt Switch Q75-77.

Q78-82 SHIFT REGISTER #1

When the Clock is turned on, all the Shift Register #1 transistors are on except Q82 which is off. As the Clock runs, the off transistor condition is advanced from Q82 to Q81, then Q80, Q79, Q78 and then back to Q82 where it repeats. This constant advancing of off from transistor to transistor is initiated by a positive pulse from the

Q75-77 SHUNT SWITCHES #1, 2 & 3

The Shunt Switches short to ground pulses from the Shift Register Driver Q66 when positive voltage is supplied from the Shift Register Program Divider; providing the Triplet Switch is off. (See Q68 Triplet Timing Regulator #2.) The Clock Multivibrator is therefore able to produce pulses at a constant rate, but all unnecessary pulses are removed.

Q68 TRIPLET TIMING REGULATOR #2

When a rhythm containing a triplet switch is on, this transistor conducts, shorting any positive voltage from the Shift Register Program Divider to ground. This prevents Shunt Switch #1 (or #2 & #3 when the Waltz Switch is on) from shorting to ground any pulses from the Shift Register Driver Q66.

CIRCUIT DESCRIPTION

Q67 TRIPLET TIMING REGULATOR #1

When a triplet rhythm is used a triplet switch is turned on, supplying voltage to this transistor causing it to conduct. This acts as a voltage divider lowering the voltage supplied through the Tempo control to the Clock Multivibrator. The lowering of voltage slows the speed of the Clock Multivibrator so that 3 pulses occur in the time span previously occupied by 4 pulses.

Q72-73 SHIFT REGISTER PROGRAM DIVIDER

On alternate pulses from Q70 this circuit turns on the Shunt Switches. This stops certain clock pulses from reaching three Shift Register #1 transistors Q78, Q81, & Q82 unless Triplet Timing Regulator #2 interferes. (See Q68)

Q74 DIVIDER STARTER

This transistor insures that Shift Register Program Divider transistor Q72 is off and transistor Q73 is on prior to depressing the Start Switch. Similarly, Shift Register #2 transistor Q89 is also maintained in its off state prior to depressing the start switch. Upon depressing the start switch the Divider Starter transistor conducts, effectively grounding the emitters of Q72 & Q89, allowing normal operation to begin.

Q84-88 PULSE AMPS #1 TO #5

Negative going voltage from the Shift Register #1 off transistor that is turning on, is converted to a negative pulse by the .068 coupling capacitor. This pulse is then amplified, inverted and connected to the following three places:

1. To Gates Q96-Q103 & Q106-Q117 via .039 capacitors.
2. To Shift Register #2.
3. To the Matrix as outputs ① to ⑤ and as a special output III to the Swing I and II Rhythm switches.

Q89-93 SHIFT REGISTER #2

This circuit functions like Shift Register #1 except the input pulses are received from four individual sources, Pulse Amps #1, #2, #4 & #5, instead of one main source. The emitter of Q89 is removed from ground by Divider Starter Q74 prior to the start switch being depressed. This allows normal operation to begin when the start switch is depressed.

Q94-95 LAMP DRIVERS

The flashing of the downbeat lamp is controlled by these two transistors and the logic from points 2, B, & D. The "lamp on" condition exists only when there is a positive voltage from 2 and no voltage at B or D. Lamp on time is the same as the length of pulse 2.

Q96-118 LOGIC GATES

One and two transistor Gates are used to produce positive output pulses. The output pulses from the single transistor Gates occur at irregular intervals. Output pulses from the two transistor Gates occur at regular intervals. All Gate pulses can best be observed by referring to the Clock Waveform Chart. The single transistor Gates produce an output pulse when a negative going pulse is applied to their base. The two transistor Gates produce pulses when one transistor (one with lowest Q#) has no voltage at its base and the other receives a negative going pulse. All output pulses from the Gates are connected to the Matrix.

MATRIX

This section of the rhythm unit combines most of the various Clock output pulses into pulse patterns which are required for the various types of rhythms. The combining of pulses is normally accomplished by resistors, although in some instances diodes are used. All output pulse patterns from the Matrix are connected to the Rhythm Selector Switches.

SELECTOR SWITCHES

These switches are the means of selecting Matrix pulse patterns, special clock outputs 2 & III, and Instrumentation control functions such as ground or 6 volts. Also, the counting sequence of the Clock circuits is controlled by the Triplet Waltz and feedback contacts of certain rhythm switches.

REVERBERATING RHYTHM

(Refer to Drawing K3)

Q58-59 SNARE DRUM & CASTANET KEYERS

Depressing any one or more of the Rhythm Keyswitches supplies a positive voltage to the base of Q58. This causes Q58 and Q59 to conduct, thus connecting a strong positive voltage to both the castanet and Snaredrum roll switches.

Q60-61 CASTANET MULTIVIBRATOR

When positive voltage is supplied from Q59 through the castanet switch and then to this multivibrator, positive voltage pulses are produced. These pulses are connected through a capacitor to the Castanet keying point on the Rim Shot Pulse Amp Q129.

Q62 BRUSH & SNARE DRUM PULSE AMP

This transistor amplifies and inverts negative pulses from the Group 1, 2 & 3 Pulse Detectors. The positive output pulses are connected through Diode D34 to the One-Shot Snare Drum Switch and through Diode D33 to the Brush Switch.

Q63-65 GROUP 1, 2 & 3 PULSE DETECTORS

Small positive voltage pulses from the Rhythm Groups 1, 2 or 3 are amplified and inverted by these three transistors. The negative output pulses are connected as follows:

1. Through Diodes 35, 37 or 39 to the Brush & Snare Drum Pulse Amp.
2. Through Diodes 36, 38 or 40 to the Tom Tom, Bongo & Block switches.

Q57 SHIMMER GENERATOR

D# and E Tone Generator signals are combined to produce a resultant AC voltage that is connected to the base of this transistor. Then when a pedal is pressed applying voltage to the transistor it produces a low frequency AC output voltage. This voltage is then sent through Diode D32 to the Brush Switch.

CIRCUIT DESCRIPTION

Q56 PEDAL PULSE AMP

Negative voltage pulses from the Pedal Cancel transistor or Pedal Pulse Generator are amplified and inverted by this transistor. The positive output pulses are connected to the following four points:

1. Through Diode D28 to the Crash Cymbal Switch.
2. Through Diode D30 to the Brush Switch.
3. Bass Drum Switch.
4. Clave Switch.

INSTRUMENTATION REVERBERATING AND AUTOMATIC RHYTHM

(Refer to Drawing K5)

Q119-120 BASS DRUM PULSE AMP & GENERATOR

Q121-122 TOM TOM PULSE AMP & GENERATOR

Q123-124 BONGO PULSE AMP & GENERATOR

Q125-126 BLOCKS PULSE AMP & GENERATOR

Q127-128 CLAVE PULSE AMP & GENERATOR

Q129-130 RIM SHOT PULSE AMP & GENERATOR

Q131-132 HI-DRUM PULSE AMP & GENERATOR

Q133-134 LO-DRUM PULSE AMP & GENERATOR

Positive voltage pulses from either the Rhythm Selector Switches or Reverberating Rhythm Switches are applied to the input of these Pulse Amps. The Pulse Amps amplify and invert these pulses which then are used to trigger the generator circuits. The generators are audio oscillators that produce a short audio signal of diminishing amplitude which connects to the Audio Output Preamp Q149. Also of special note are certain inputs to the generators that by-pass the Pulse Amps, resulting in softer generator output signals.

Q146 NOISE GENERATOR

Positive voltage applied to the emitter of this transistor back biases the base-emitter junction producing a random noise signal. This noise output signal is connected to the Snare Drum Crash Cymbal and Brush Noise Amps.

Q135-137 SNARE DRUM MULTIVIBRATOR AND TRIGGER

The Snare Drum Trigger Q137 receives either a positive voltage pulse or a constant positive voltage from the Snare Drum One-Shot, Roll Switch or Rhythm Selector Switches. This pulse or voltage turns on the Snare Drum Trigger either momentarily or as long as the positive voltage is applied. As long as the trigger transistor is on the Snare Drum Multivibrator runs producing one or a series of positive and negative output pulses. The negative output pulses key through Diode D71 the Hi-Drum and Lo-Drum Generators. Simultaneously, the positive pulses key through Diode D72 the Snare Drum Noise Amp and through Diode D75 the Snare Drum Gate. The total Snare Drum sound is therefore a combination of the Hi-Drum, Lo-Drum and Snare Drum Noise.

Q147-Q148 SNARE DRUM NOISE AMP & GATE

These two transistors amplify and voice the noise signal from the Noise Generator. Each pulse from the Snare Drum Multivibrator momentarily turns on the Noise Amp and Gate. This results in short bursts of amplified and voiced Snare Drum noise signal. The noise output signal from the Gate connects to the Audio Output Preamp.

Q142-Q143 CRASH CYMBAL TRIGGER

A clock pulse from the Rhythm Selector Switch causes this circuit to change state producing a strong positive voltage pulse. This pulse is sent through Diode D68 where various pulse control circuits may modify the pulse length or shape, then through D69 to the Crash Cymbal Noise Amp and Gate.

Q144-Q145 CRASH CYMBAL NOISE AMP & GATE

These two transistors function like the Snare Drum Noise Amp and Gate. However, only Automatic Rhythm Cymbal keying pulses are received from the Crash Cymbal Trigger. Whereas, Reverberating Rhythm keying pulses are connected directly from the Pedal Pulse Amp Q56 when the Crash Cymbal Switch is on.

Q138-Q141 BRUSH TRIGGER, NOISE AMP AND GATE

These circuits function like the Crash Cymbal circuits, but with additional pulse isolation diodes.

Q149 AUDIO OUTPUT PREAMP

All of the audio output signals are connected to and amplified by this preamp. The balance control connected to the base element controls the relative amount of drum or noise signal. All rhythm output signal is connected through the Rhythm Volume Control to the Main Preamp.

ADJUSTMENTS

(Rhythm)

VR6 CASTANET SPEED

VR16 SNARE DRUM SPEED

The rate of Castanet and Snare Drum beats is approximately 15-20 beats per second. Adjust using a small screwdriver taking into consideration customer preference.

VR8 BASS DRUM

VR9 TOM TOM

VR10 BONGO

VR11 BLOCKS

VR12 CLAVE

VR13 RIM SHOT

VR14 HI-DRUM

VR15 LO-DRUM

These adjustments affect the length of the instruments tone. Adjusting the length is similar to adjusting an actual instrument. This can best be done by ear as the instrument is being keyed. Adjustment is correct when the instrument sounds most realistic. Too little of an adjustment setting causes the instrument to sound dead, too much and it will sound continuously.

CIRCUIT DESCRIPTION

VR17 BRUSH VOLUME

VR18 CRASH CYMBAL VOLUME

VR19 SNARE DRUM NOISE VOLUME

Generally the best setting of these adjustments is one at which these instruments sound balanced when compared to the drums. Always set these adjustments with the balance control set at its midpoint. Proper Snare Drum noise adjustment is achieved when the Hi and Lo Drum sounds blend with the snare noise producing the most realistic Snare Drum.

IMPORTANT

Adjusting Hi-Drum and Lo-Drum will also affect the voicing of the Snare Drum. See Snare Drum Noise volume adjustment.

GENERAL TROUBLESHOOTING GUIDE

Failure of the Clock will result in:

1. No rhythms at all.
2. Uneven, incomplete or wild running rhythms.

Failure of the Matrix will result in:

1. Incomplete rhythms or possible extra beats in some rhythms.

Failure of a Rhythm Selector Switch will result in:

1. A single incomplete rhythm or possibly uneven rhythm if trouble is located in triplet timing switch contacts.

Failure or improper adjustment in the Instrumentation will result in:

1. Incomplete rhythms.
2. Poor sound quality of a specific rhythm instrument.
3. A continuous sound with Rhythm Selector Switches "Off."
4. Rhythm sounds weak or not at all.

Failure in the Power Supply.

1. Completely dead unit.
2. Unstable rhythm speeds.
3. No rhythms.

1. NO RHYTHMS AT ALL, NOTHING HAPPENS WHEN START SWITCH IS DEPRESSED.

- A. No power. Check fuse, power supply voltages, and AC cord.
- B. Check instrumentation board Audio Output Preamp Q149, and organ amplifier (Downbeat Lamp will still be working).
- C. Check Clock Multi (Q69, Q70, D41, D42), Shift Register Driver Q66, Shift Register Starter, Shift Register 1 transistor open, Shunt Switch 2 or 3 shorted, Program Divider Q73 continuous positive output (Downbeat Lamp will not work correctly).

2. RHYTHM STARTS BUT DOES NOT CONTINUE

- A. Shunt Switches 1 or 2 shorted, Shift Register 1 transistor open.

3. IRREGULAR RHYTHMS

- A. Shift Register 1 or 2 transistor shorted.

4. A PORTION OF RHYTHM REPEATED CONTINUOUSLY

- A. Pulse Amp or Shift Register 2 transistor open.

5. SPECIFIC RHYTHM TYPES OPERATE INCORRECTLY.

- A. Duplet Rhythms only (See Clock Waveforms Drawing) Shunt Switch 1 Q75 open.
- B. Duplet and Triplet rhythms (Waltzes okay) Shunt Switches 2 and 3 open.
- C. Duplet and Triplet rhythms stop (Waltzes run)—Program Divider Q73 always off.
- D. Waltz or Swing Waltz only—Feed back Switch or Waltz Switch.
- E. Waltz and Swing Waltz only—Logic Gate 5B has transistor shorted.

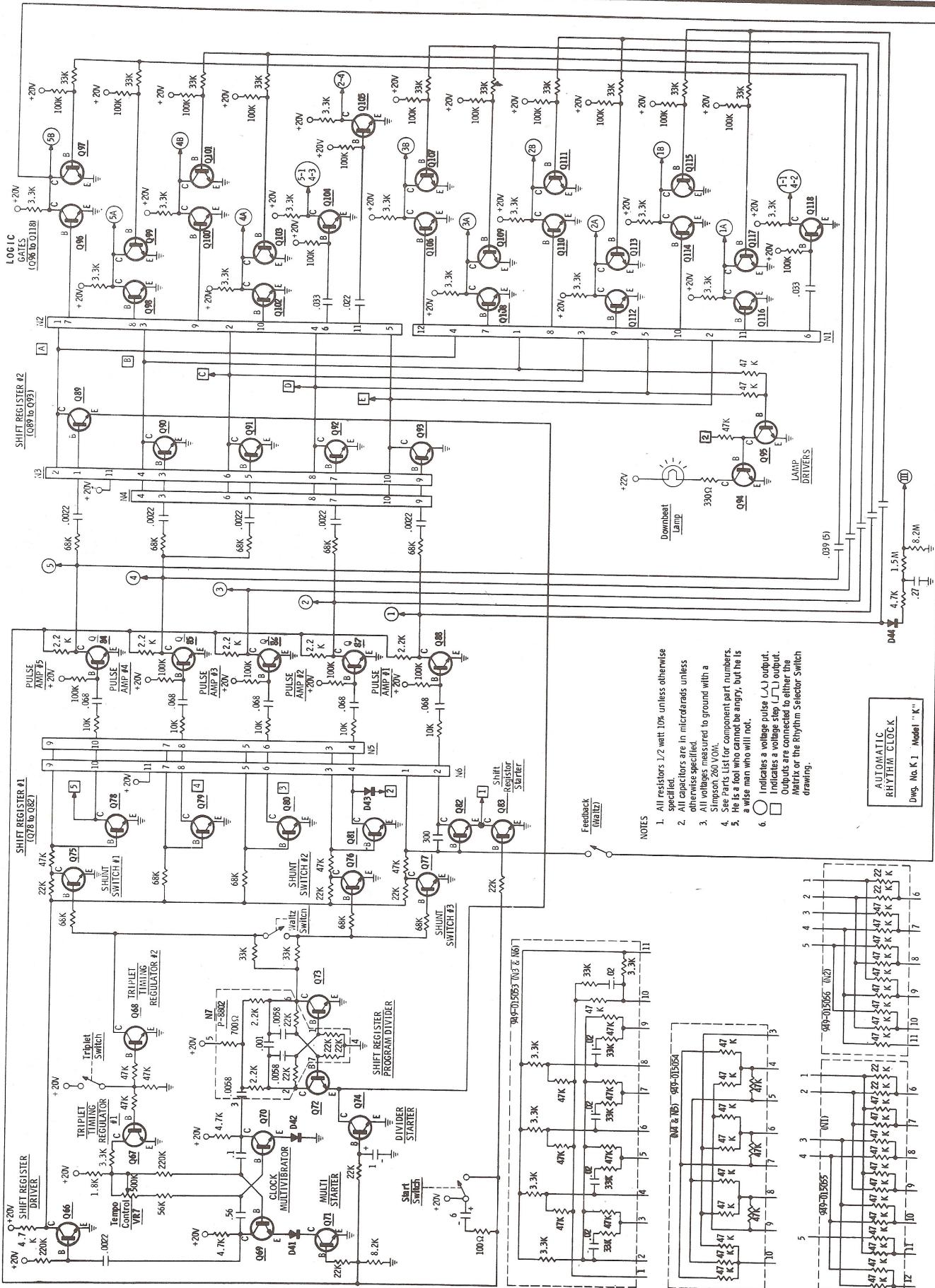
6. VARIOUS INSTRUMENTS OR INSTRUMENT GROUPS, SOUND MORE OR LESS OFTEN THEN THEY SHOULD.

- A. Logic Gate may have one transistor open, producing more output pulses than desired.
- B. Logic Gate may have one transistor shorted, eliminating all output pulses from that Gate.

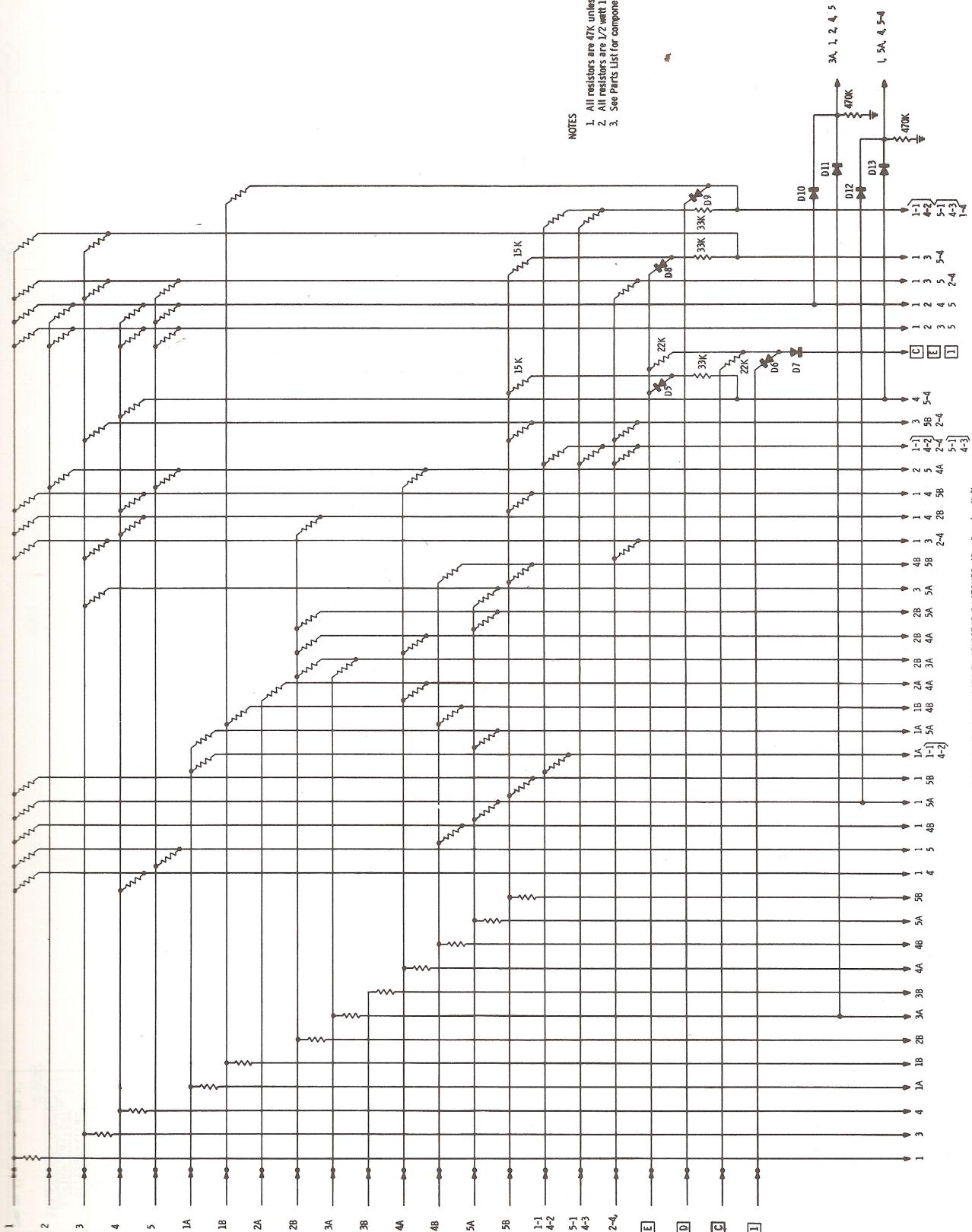
7. INSTRUMENTATION

- A. Failure of a specific Instrument Generator (See Instrumentation and Instrumentation Schematic)
- B. A continuous sound. Nothing will affect this sound except the rhythm volume control. (See Instrumentation Adjustments.)
- C. Poor sound quality of a specific rhythm voice. (See Instrumentation Adjustments.)
- D. Improper volume relationship between cymbals and drums. (See Instrumentation Adjustments.)

SCHEMATIC K1



SCHEMATIC K2



NOTES

1. All resistors are 47K unless otherwise specified.
2. All resistors are 1/2 watt 10% unless otherwise specified.
3. See Part 1 for component part numbers.

1.1. All resistors are 47K unless otherwise specified

1. All resistors are 1/2 watt 10% unless otherwise specified.
2. All resistors are 1/2 watt 10% unless otherwise specified.
3. See Part I list for component part numbers.

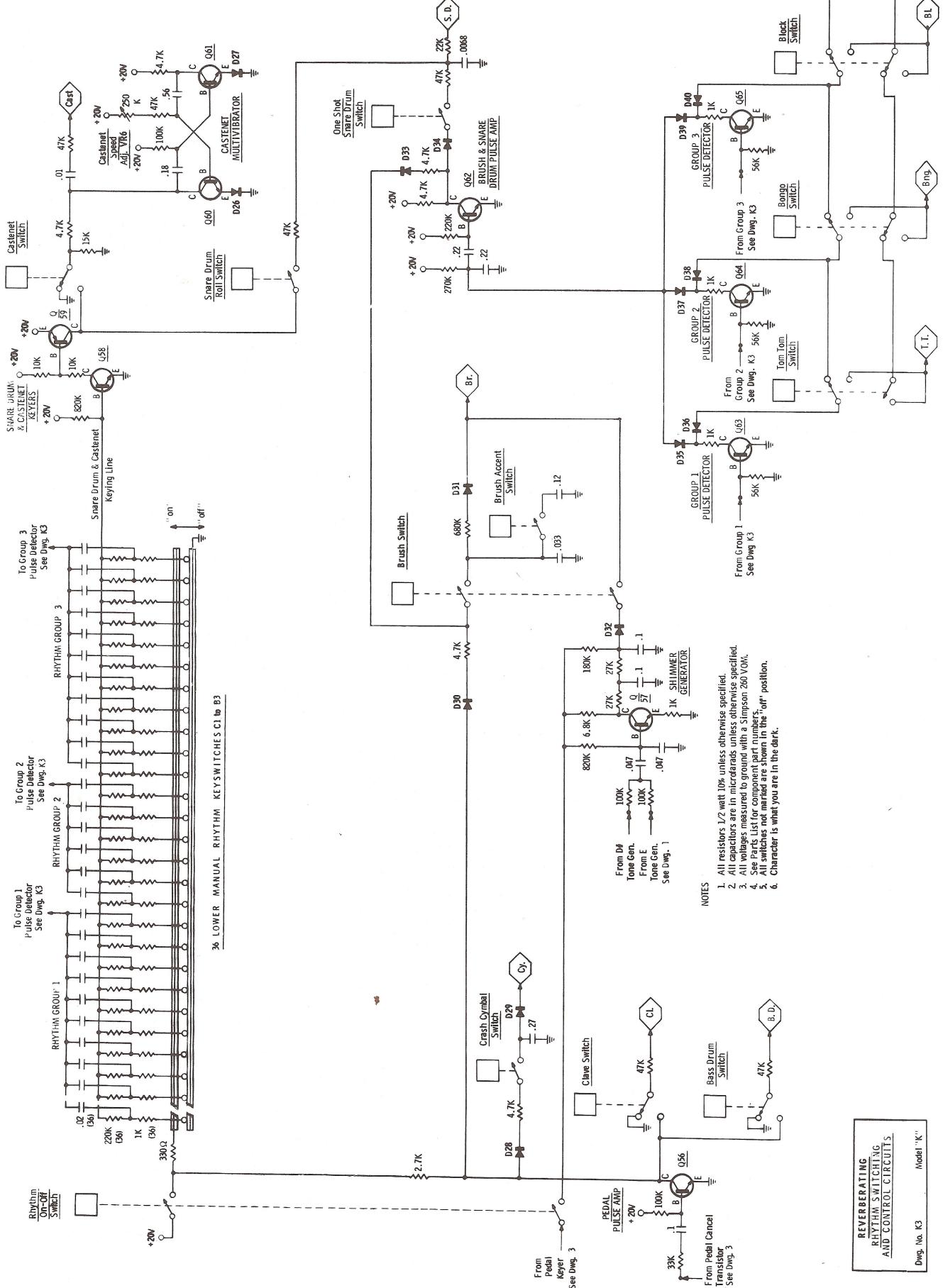
MATRIX
Dwq. No. K2
Model "K"

MATRIX

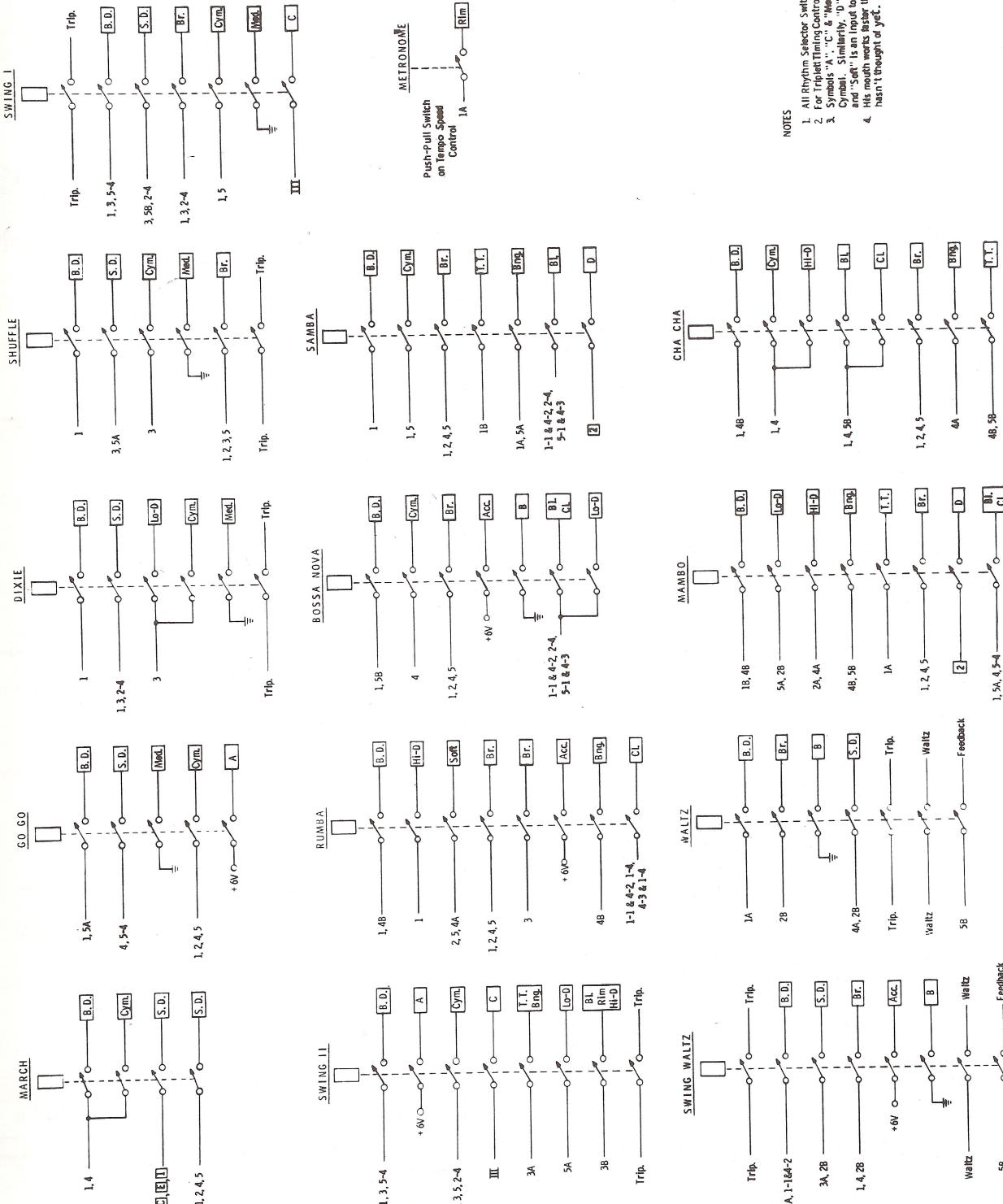
Dwg. № K2 Model "K"

COMBINED TIMING PHASES TO SELECTOR SWITCHES (See Drawing K-4)

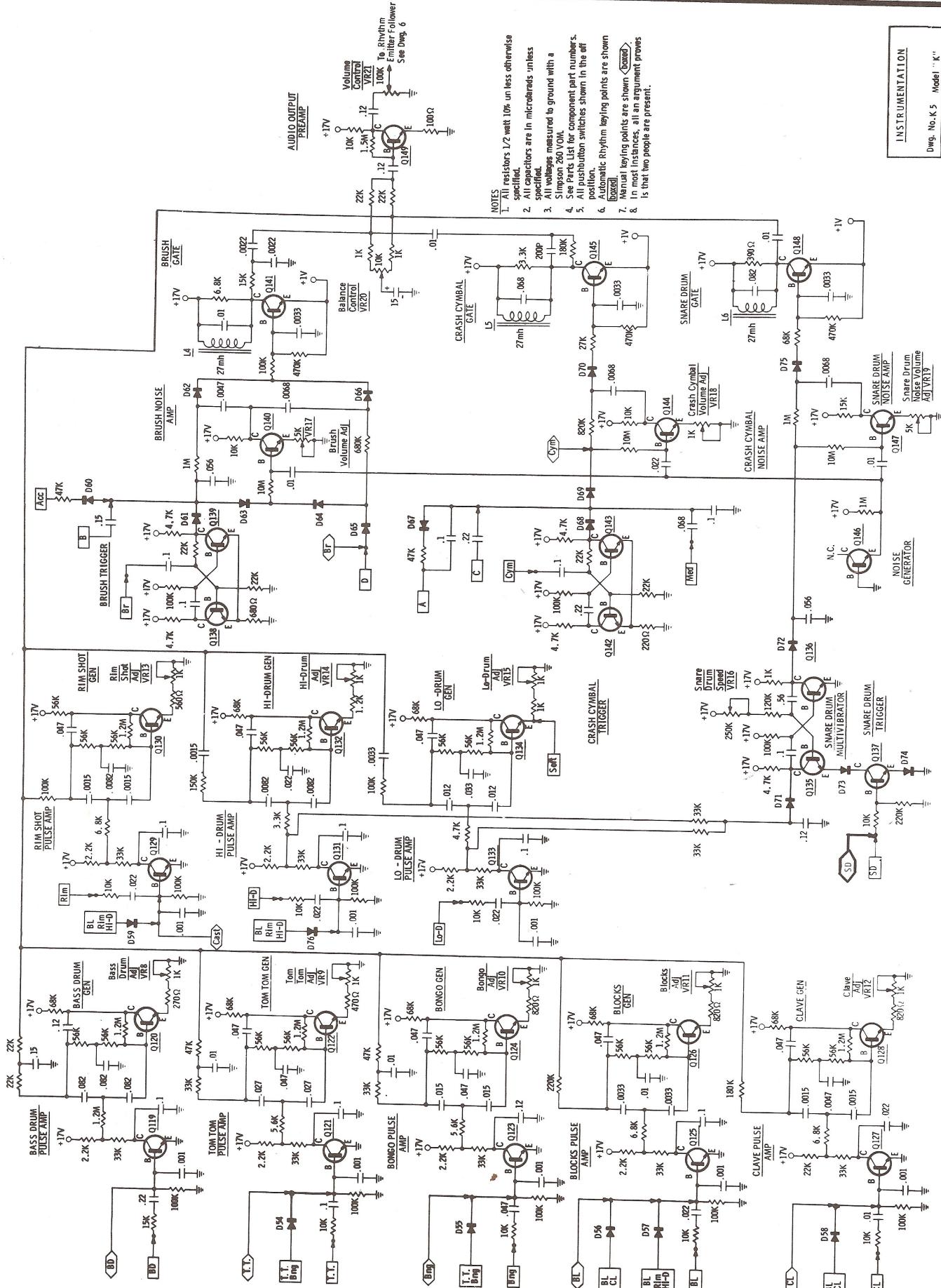
SCHEMATIC K3



SCHEMATIC K4

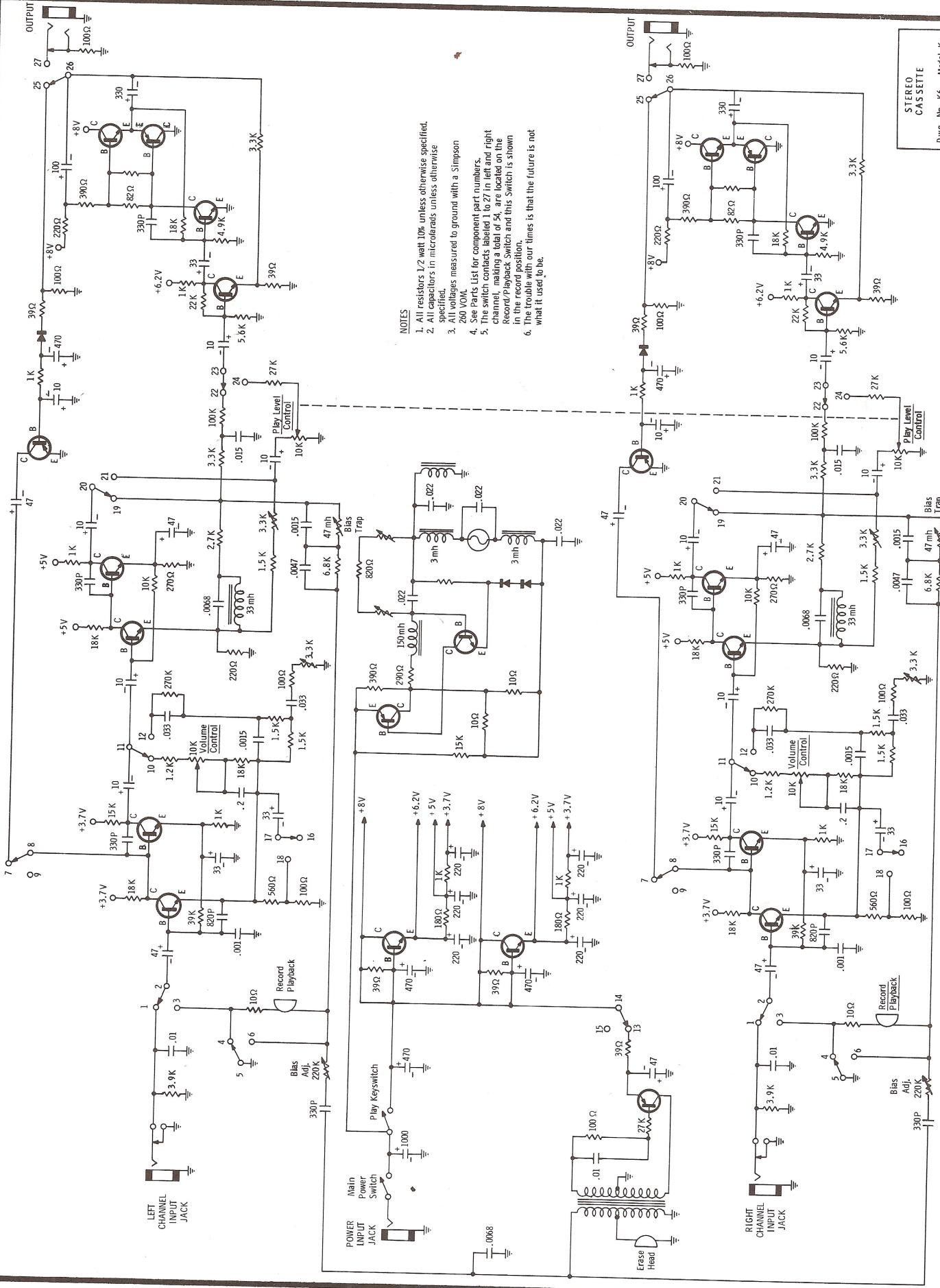


SCHEMATIC K5



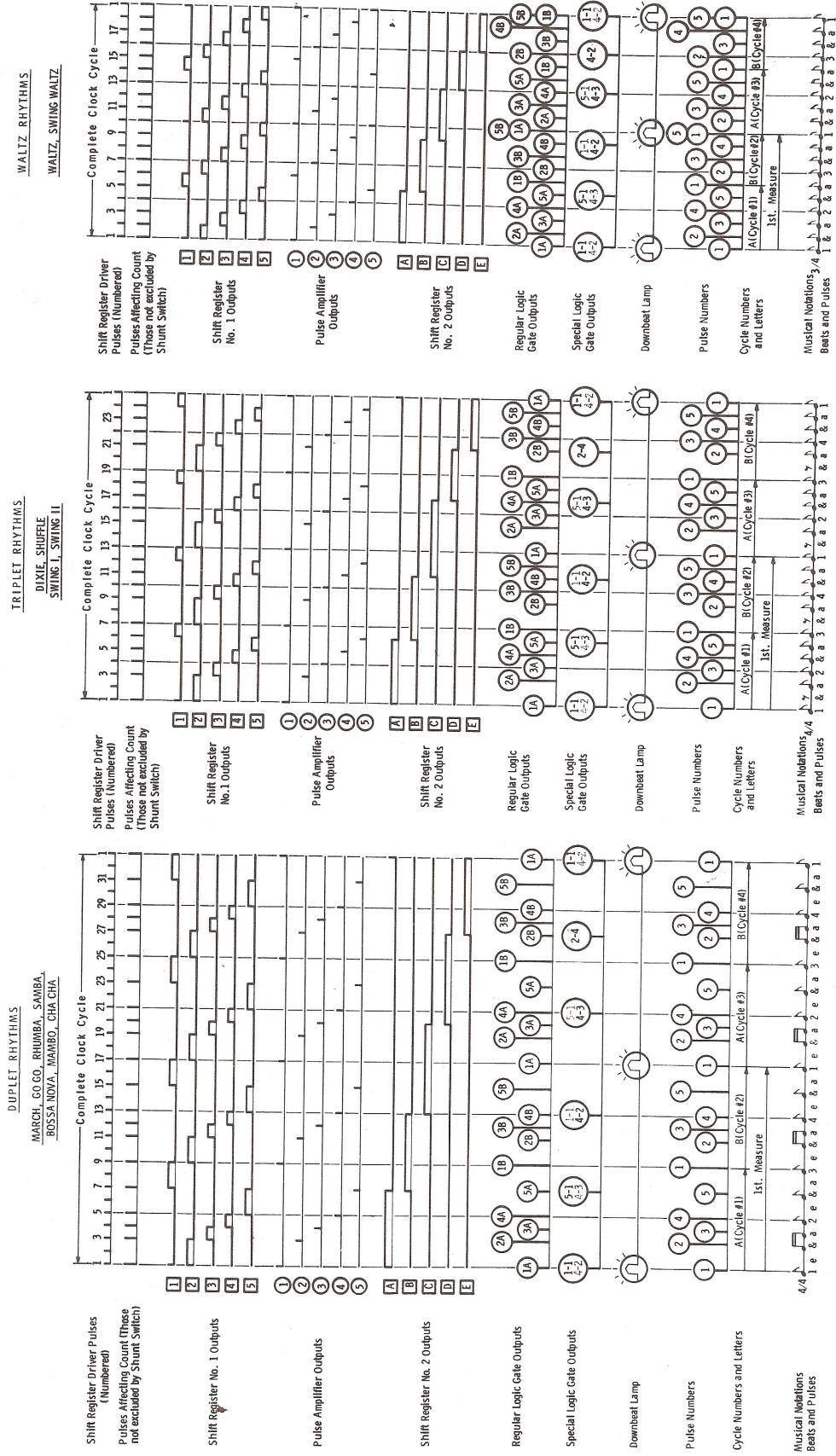
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SCHEMATIC K6



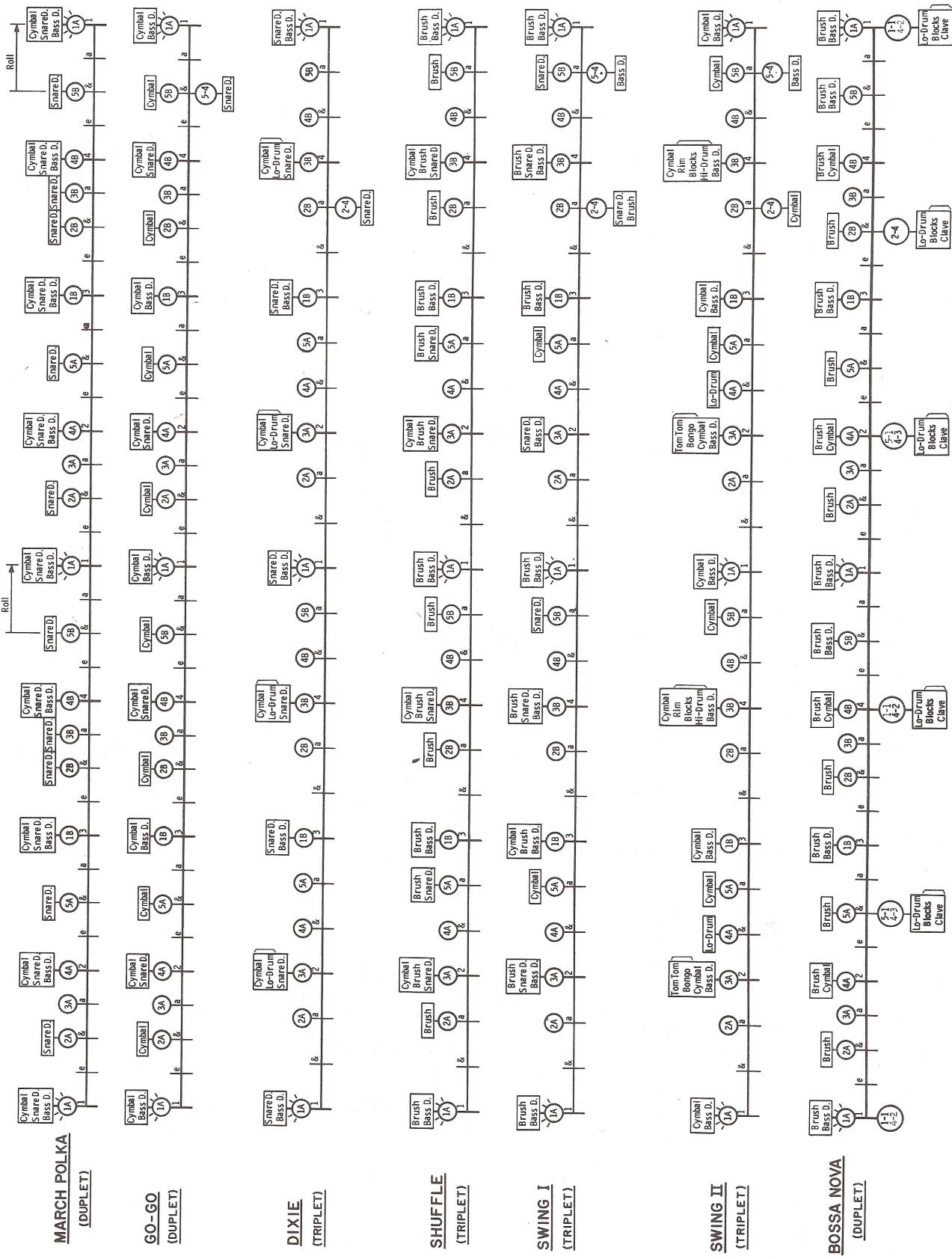
DIAGRAM

CLOCK WAVEFORMS



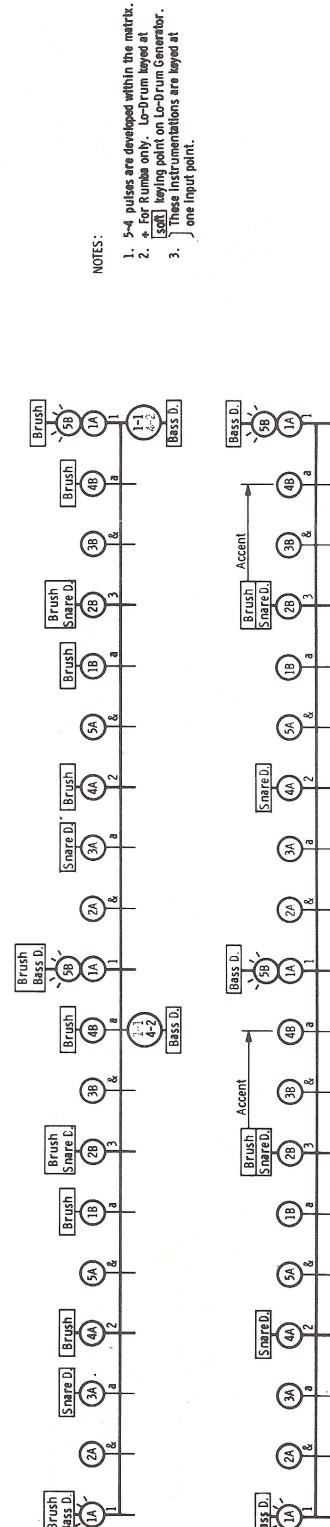
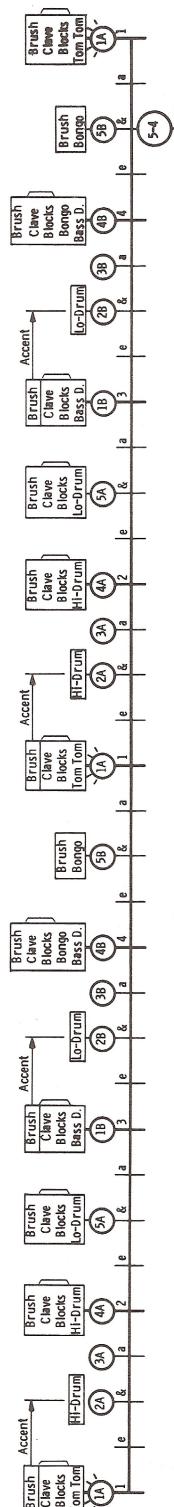
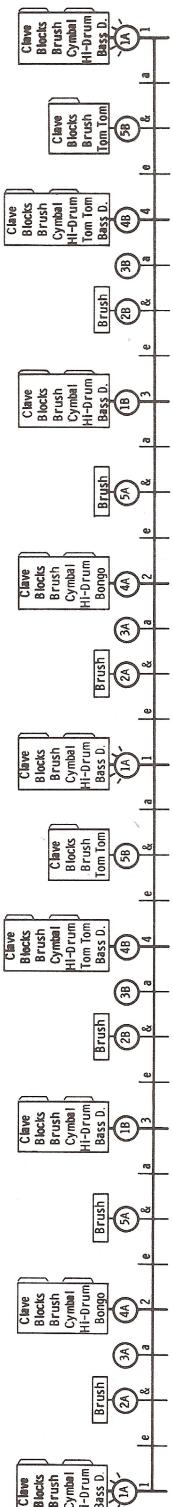
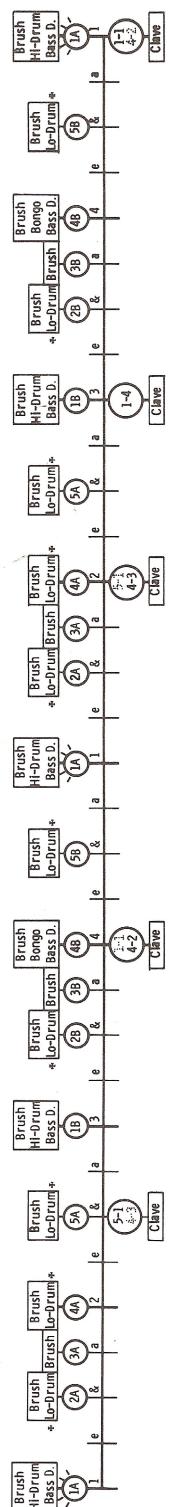
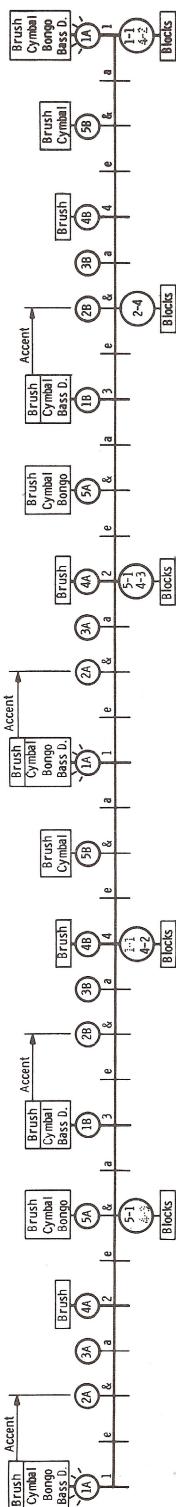
DIAGRAM

RHYTHM PATTERN DIAGRAMS



DIAGRAM

RHYTHM PATTERN DIAGRAMS



WALTZ
(WALTZ)

NOTES:

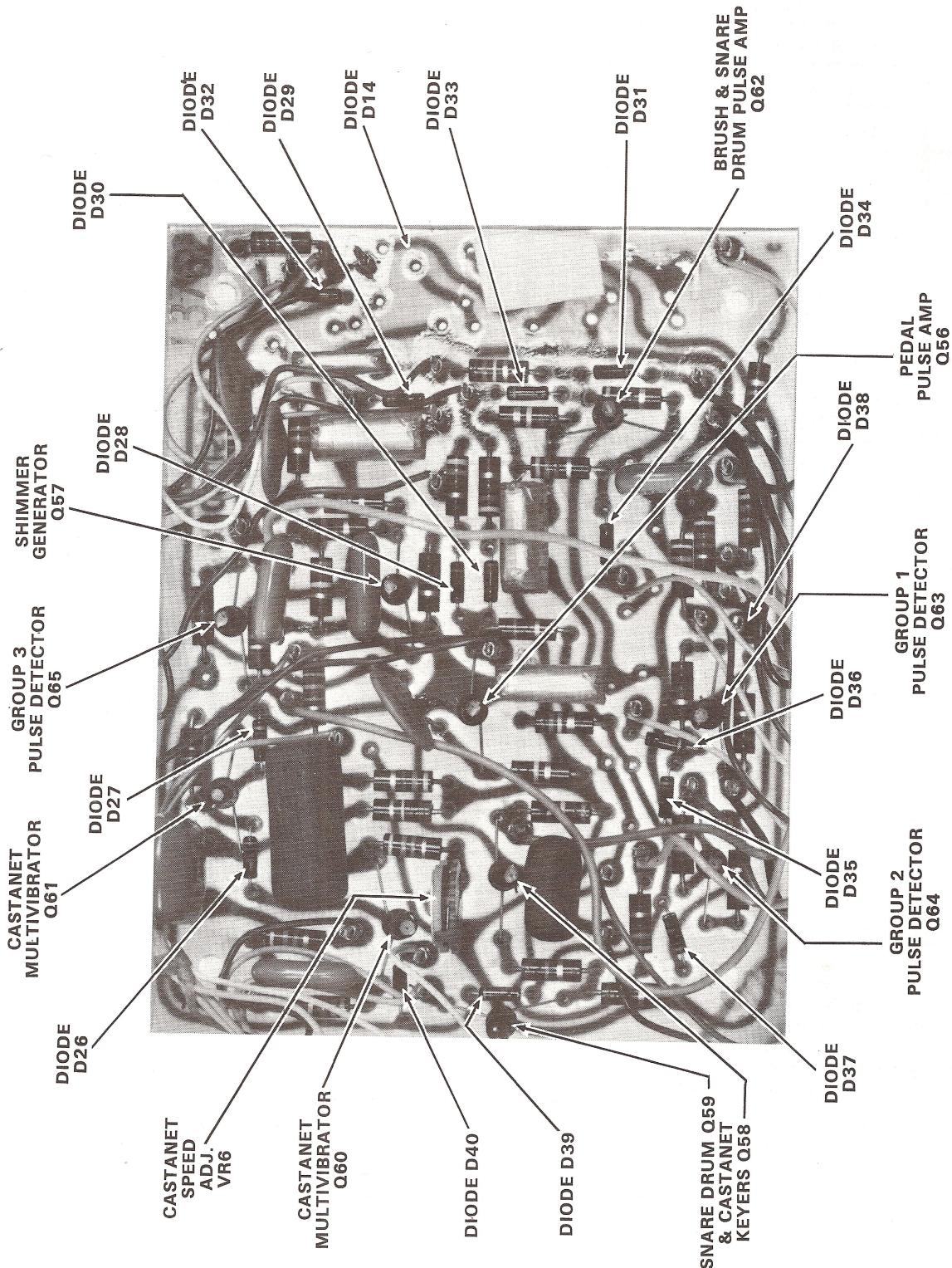
1. 5-4 pulses are developed within the matrix.
2. * for Rumba only.
3. These instruments are keyed at one input point.

K TRANSISTOR LOCATION CHART

Q Nos.	NAME OF BOARD	Q Nos.	NAME OF BOARD	Q Nos.	NAME OF BOARD
56	Reverberating Rhythm Board	90	Clock & Matrix Board	124	Instrumentation Board
57	Reverberating Rhythm Board	91	Clock & Matrix Board	125	Instrumentation Board
58	Reverberating Rhythm Board	92	Clock & Matrix Board	126	Instrumentation Board
59	Reverberating Rhythm Board	93	Clock & Matrix Board	127	Instrumentation Board
60	Reverberating Rhythm Board	94	Clock & Matrix Board	128	Instrumentation Board
61	Reverberating Rhythm Board	95	Clock & Matrix Board	129	Instrumentation Board
62	Reverberating Rhythm Board	96	Clock & Matrix Board	130	Instrumentation Board
63	Reverberating Rhythm Board	97	Clock & Matrix Board	131	Instrumentation Board
64	Reverberating Rhythm Board	98	Clock & Matrix Board	132	Instrumentation Board
65	Reverberating Rhythm Board	99	Clock & Matrix Board	133	Instrumentation Board
66	Clock & Matrix Board	100	Clock & Matrix Board	134	Instrumentation Board
67	Clock & Matrix Board	101	Clock & Matrix Board	135	Instrumentation Board
68	Clock & Matrix Board	102	Clock & Matrix Board	136	Instrumentation Board
69	Clock & Matrix Board	103	Clock & Matrix Board	137	Instrumentation Board
70	Clock & Matrix Board	104	Clock & Matrix Board	138	Instrumentation Board
71	Clock & Matrix Board	105	Clock & Matrix Board	139	Instrumentation Board
72	Clock & Matrix Board	106	Clock & Matrix Board	140	Instrumentation Board
73	Clock & Matrix Board	107	Clock & Matrix Board	141	Instrumentation Board
74	Clock & Matrix Board	108	Clock & Matrix Board	142	Instrumentation Board
75	Clock & Matrix Board	109	Clock & Matrix Board	143	Instrumentation Board
76	Clock & Matrix Board	110	Clock & Matrix Board	144	Instrumentation Board
77	Clock & Matrix Board	111	Clock & Matrix Board	145	Instrumentation Board
78	Clock & Matrix Board	112	Clock & Matrix Board	146	Instrumentation Board
79	Clock & Matrix Board	113	Clock & Matrix Board	147	Instrumentation Board
80	Clock & Matrix Board	114	Clock & Matrix Board	148	Instrumentation Board
81	Clock & Matrix Board	115	Clock & Matrix Board	149	Instrumentation Board
82	Clock & Matrix Board	116	Clock & Matrix Board		
83	Clock & Matrix Board	117	Clock & Matrix Board		
84	Clock & Matrix Board	118	Clock & Matrix Board		
85	Clock & Matrix Board	119	Instrumentation Board		
86	Clock & Matrix Board	120	Instrumentation Board		
87	Clock & Matrix Board	121	Instrumentation Board		
88	Clock & Matrix Board	122	Instrumentation Board		
89	Clock & Matrix Board	123	Instrumentation Board		

REVERBERATING RHYTHM BOARD

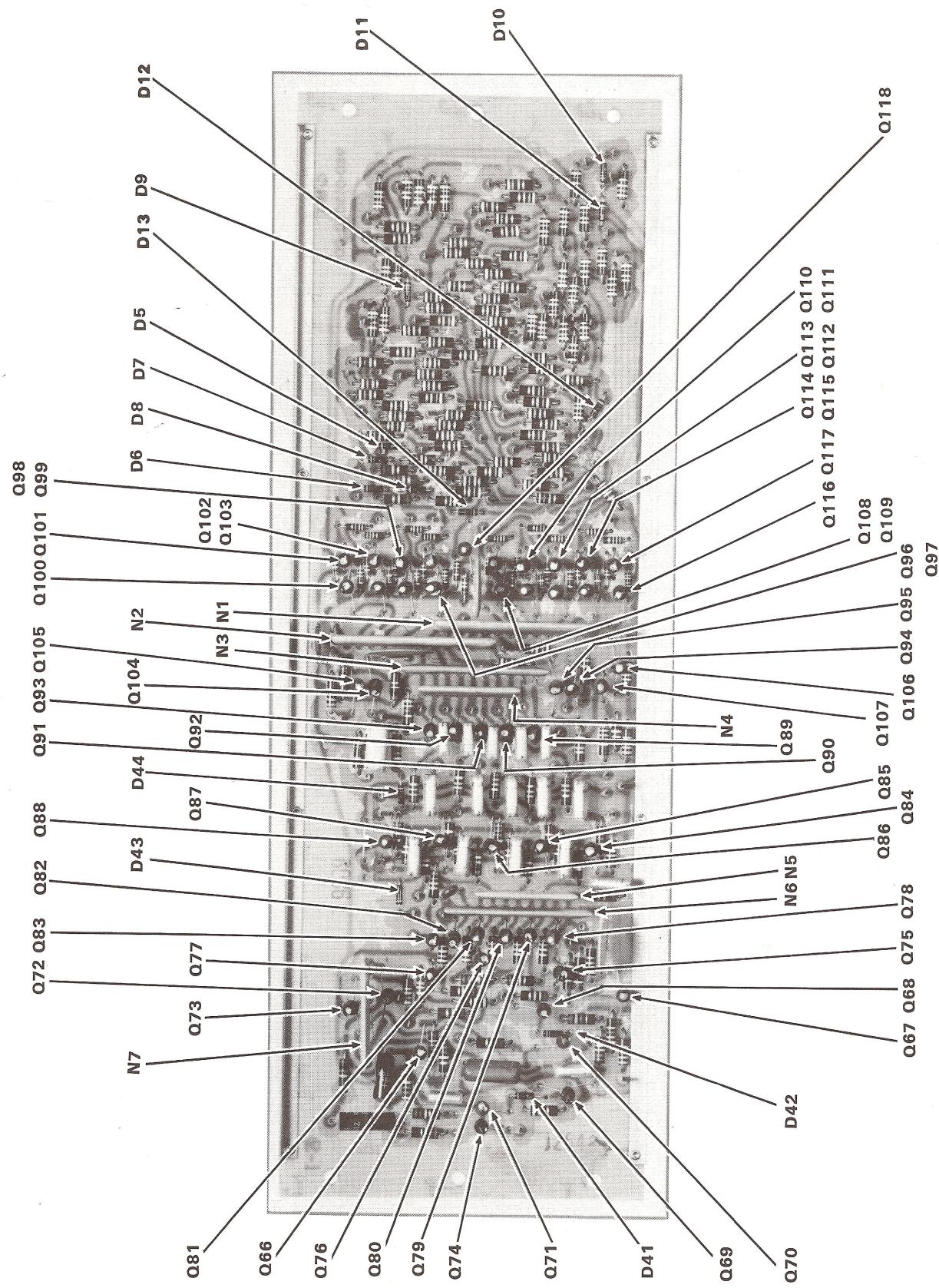
(Located Behind Rhythm Switches)



PHOTOGRAPHS

CLOCK AND MATRIX BOARD

(Located Above Expression Pedal)



PHOTOGRAPHS

INSTRUMENTATION BOARD

(Located Above Expression Pedal)

